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NVIDIA Compute Comparison

Benchmarks for a future article.

Automated Executive Summary

RTX 3080 had the most wins, coming in first place for 96% of the tests.

Based on the geometric mean of all complete results, the fastest (RTX 3080) was 5.251x the speed of the slowest (GTX 1060).

The results with the greatest spread from best to worst included:

Blender (Blend File: Pabellon Barcelona - Compute: NVIDIA OptiX) at 16.467x
Blender (Blend File: Fishy Cat - Compute: NVIDIA OptiX) at 15.145x
Blender (Blend File: Classroom - Compute: NVIDIA OptiX) at 13.28x
clpeak (OpenCL Test: Integer Compute INT) at 11.885x
clpeak (OpenCL Test: Single-Precision Float) at 6.859x
OctaneBench (Total Score) at 6.64x
Geekbench (Test: GPU NVIDIA CUDA) at 6.187x
RedShift Demo at 6.186x
Blender (Blend File: Barbershop - Compute: NVIDIA OptiX) at 5.959x
LuxCoreRender OpenCL (Scene: DLSC) at 5.37x.

Test Systems:

GTX 1060

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce GTX 1060 6GB (1506/4006MHz), Audio: NVIDIA GP106 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 1280
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

GTX 1660 SUPER

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: eVGA NVIDIA GeForce GTX 1660 SUPER 6GB (1530/7000MHz), Audio: NVIDIA TU116 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 1408
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

GTX 1660 Ti

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: eVGA NVIDIA GeForce GTX 1660 Ti 6GB (1500/6000MHz), Audio: NVIDIA TU116 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 1536
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 2060

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 2060 6GB (1365/7000MHz), Audio: NVIDIA TU106 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 1920
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 2060 SUPER

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 2060 SUPER 8GB (1470/7000MHz), Audio: NVIDIA TU106 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 2176
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 2070

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: ASUS NVIDIA GeForce RTX 2070 8GB (1410/7000MHz), Audio: NVIDIA TU106 HD Audio, Monitor:

ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 2304
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 2070 SUPER

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 2070 SUPER 8GB (1605/7000MHz), Audio: NVIDIA TU104 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 2560
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 2080

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: Zotac NVIDIA GeForce RTX 2080 8GB (1515/7000MHz), Audio: NVIDIA TU104 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 2944
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 2080 SUPER

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 2080 SUPER 8GB (1650/7750MHz), Audio: NVIDIA TU104 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 3072
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 2080 Ti

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 2080 Ti 11GB (1350/7000MHz), Audio: NVIDIA TU102 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 4352
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

TITAN RTX

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA TITAN RTX 24GB (555/810MHz), Audio: NVIDIA TU102 HD Audio, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686

--with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 4608
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 3060 Ti

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 3060 Ti 8GB (1665/7000MHz), Audio: NVIDIA Device 228b, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 4864
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

RTX 3080

Processor: AMD Ryzen 9 5950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: ASUS ROG CROSSHAIR VIII HERO (WI-FI) (2311 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 2000GB Corsair Force MP600 + 2000GB, Graphics: NVIDIA GeForce RTX 3080 10GB (1710/9501MHz), Audio: NVIDIA Device 1aef, Monitor: ASUS MG28U, Network: Realtek RTL8125 2.5GbE + Intel I211 + Intel Wi-Fi 6 AX200

OS: Ubuntu 20.04, Kernel: 5.4.0-54-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.8, Display Driver: NVIDIA 455.45.01, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.1.114, Vulkan: 1.2.142, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 3840x2160

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq performance - CPU Microcode: 0xa201009
OpenCL Notes: GPU Compute Cores: 8704
Python Notes: Python 2.7.18 + Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

NVIDIA Compute Comparison

	GTX 1060	GTX 1660 SUPER	GTX 1660 Ti	RTX 2060	RTX 2060 SUPER	RTX 2070	RTX 2070 SUPER	RTX 2080	RTX 2080 SUPER	RTX 2080 Ti	TITAN RTX	RTX 3060 Ti	RTX 3080
Waifu2x-NCNN Vulkan - 2x - 3 - Yes (sec)	9.251	7.060	7.243	5.792	5.553	5.211	4.769	4.582	4.368	3.835	4.124	4.236	3.519
Normalized	38.04%	49.84%	48.58%	60.76%	63.37%	67.53%	73.79%	76.8%	80.56%	91.76%	85.33%	83.07%	100%
Standard Deviation	0.9%	0.9%	1%	1.3%	1.4%	1.1%	1.6%	1.3%	1.3%	1.6%	1.6%	2.1%	2.4%
FAHBench (Ns/Day)	101.2902	136.0813	129.4973	180.9695	189.0783	205.4939	227.7661	242.5543	257.4767	300.8935	270.6805	234.5598	306.7671
Normalized	33.02%	44.36%	42.21%	58.99%	61.64%	66.99%	74.25%	79.07%	83.93%	98.09%	88.24%	76.46%	100%
Standard Deviation	0%	0.1%	0.3%	0.2%	0.3%	0.3%	0.1%	0.1%	0.2%	0.2%	0.7%	0.1%	0.2%
FAHBench (Ns/Day/Watt)	1.51	1.63	1.83	1.77	1.73	1.88	1.89	1.80	1.98	1.84	1.66	2.10	1.68
Normalized	71.9%	77.62%	87.14%	84.29%	82.38%	89.52%	90%	85.71%	94.29%	87.62%	79.05%	100%	80%
OctaneBench - Total Score (Score)	80.90751	131.85	124.73	192.59	225.40	242.72	258.47	259.16	265.14	349.41	350.66	378.71	537.242047
Normalized	15.06%	24.54%	23.22%	35.85%	41.96%	45.18%	48.11%	48.24%	49.35%	65.04%	65.27%	70.49%	100%
OctaneBench - Total Score (Score/Watt)	1.06	1.21	1.28	1.63	1.57	1.72	1.68	1.59	1.73	1.55	1.50	2.28	1.87
Normalized	46.49%	53.07%	56.14%	71.49%	68.86%	75.44%	73.68%	69.74%	75.88%	67.98%	65.79%	100%	82.02%
LuxCoreRender OpenCL - LuxCore Benchmark (M samples/sec)	1.45	2.20	1.96	2.76	3.26	3.51	3.57	3.48	3.61	4.60	4.42	5.79	7.26
Normalized	19.97%	30.3%	27%	38.02%	44.9%	48.35%	49.17%	47.93%	49.72%	63.36%	60.88%	79.75%	100%
Standard Deviation	6.3%	0.8%	1.5%	0.8%	1.1%	0.5%	5.9%	4.3%	0.4%	0.8%	2%	6.5%	3.5%
LuxCoreRender OpenCL - LuxCore Benchmark (M samples/sec/Watt)	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.02	0.04	0.03
Normalized	50%	50%	75%	75%	75%	75%	75%	50%	75%	50%	50%	100%	75%
LuxCoreRender OpenCL - DLSC (M	1.73	2.60	2.37	3.31	3.96	4.19	4.29	4.20	4.34	5.65	5.46	7.13	9.29
Normalized	18.62%	27.99%	25.51%	35.63%	42.63%	45.1%	46.18%	45.21%	46.72%	60.82%	58.77%	76.75%	100%
Standard Deviation	6.4%	0.3%	0.3%	0.6%	0.3%	0.1%	6.4%	5%	0.7%	0.2%	0.3%	6.7%	5.7%

NVIDIA Compute Comparison

LuxCoreRender OpenCL - DLSC (M samples/sec/Watt)	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04
Normalized	50%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	100%	100%
LuxCoreRender OpenCL - R.C.a.P (M samples/sec)	5.34	5.54	4.764166667	7.83	10.45	10.98	9.86	8.95	9.03	12.08	12.13	16.84	20.82
Normalized	25.65%	26.61%	22.88%	37.61%	50.19%	52.74%	47.36%	42.99%	43.37%	58.02%	58.26%	80.88%	100%
Standard Deviation	7%	1%	0.2%	0.8%	0.6%	1%	9.3%	6.9%	1%	0.5%	1.3%	11.8%	8.5%
LuxCoreRender OpenCL - R.C.a.P (M samples/sec/Watt)	0.08	0.07	0.07	0.08	0.09	0.10	0.09	0.08	0.08	0.08	0.07	0.15	0.11
Normalized	53.33%	46.67%	46.67%	53.33%	60%	66.67%	60%	53.33%	53.33%	53.33%	46.67%	100%	73.33%
LuxCoreRender OpenCL - Food (M	0.63	1.05	0.99	1.17	1.17	1.27	1.78	1.79	1.88	2.11	1.99	2.80	3.54
Normalized	17.8%	29.66%	27.97%	33.05%	33.05%	35.88%	50.28%	50.56%	53.11%	59.6%	56.21%	79.1%	100%
Standard Deviation	7.6%	1.3%	1.9%	1.4%	2%	0.2%	8%	5.9%	1.3%	0.6%	0.7%	7.6%	6.3%
LuxCoreRender OpenCL - Food (M samples/sec/Watt)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
Normalized	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	100%	100%
ArrayFire - C.G.O (ms)	5.023	2.670	3.228	2.671	2.198	2.094	2.076	2.094	1.917	1.678	1.756	2.094	1.627
Normalized	32.39%	60.94%	50.4%	60.91%	74.02%	77.7%	78.37%	77.7%	84.87%	96.96%	92.65%	77.7%	100%
Standard Deviation	0.9%	1.7%	0.3%	1.1%	0.5%	0.3%	1.3%	1.2%	1.8%	0.5%	1.2%	0.4%	1.6%
clpeak - S.P.F (GFLOPS)	4095	4543	4448	5480	6758	7203	8537	9118	10190	13338	13605	16013	28089
Normalized	14.58%	16.17%	15.84%	19.51%	24.06%	25.65%	30.39%	32.46%	36.28%	47.49%	48.43%	57.01%	100%
Standard Deviation	6.2%	2.3%	3.9%	7.4%	4.1%	5%	3.9%	2.8%	3.6%	4.7%	3.7%	0.6%	2.7%
clpeak - S.P.F (GFLOPS/Watt)	101.60	117.45	142.17	131.53	124.64	157.05	144.93	152.55	179.85	158.64	132.66	327.99	309.31
Normalized	30.98%	35.81%	43.35%	40.1%	38%	47.88%	44.19%	46.51%	54.83%	48.37%	40.45%	100%	94.3%
clpeak - D.P.D (GFLOPS)	150.15	170.63	173.67	229.29	245.51	267.76	306.51	343.49	373.04	516.53	498.14	302.82	514.40
Normalized	29.07%	33.03%	33.62%	44.39%	47.53%	51.84%	59.34%	66.5%	72.22%	100%	96.44%	58.63%	99.59%
Standard Deviation	0.3%	0.3%	0.5%	0.2%	0.3%	0.5%	0.2%	0.5%	0.1%	0.7%	0.9%	0.3%	0.5%
clpeak - D.P.D (GFLOPS/Watt)	3.07	2.99	3.67	3.44	3.07	3.79	3.58	3.57	4.29	4.14	3.56	4.04	3.52
Normalized	71.56%	69.7%	85.55%	80.19%	71.56%	88.34%	83.45%	83.22%	100%	96.5%	82.98%	94.17%	82.05%
clpeak - I.C.I (GIOPS)	1226	4308	4444	5248	6754	7134	8495	9509	10455	13254	13266	8291	14574
Normalized	8.41%	29.56%	30.49%	36.01%	46.34%	48.95%	58.29%	65.25%	71.74%	90.94%	91.02%	56.89%	100%
Standard Deviation	4.6%	2.6%	4.7%	3.4%	4%	4.4%	4.4%	2.7%	3.6%	4%	4.7%	3%	3.7%

NVIDIA Compute Comparison

clpeak - I.C.I (GIOPS/Watt)	19.39	96.51	112.27	103.54	99.10	120.15	119.43	127.83	152.30	147.86	118.27	128.32	116.90
Normalized	12.73%	63.37%	73.72%	67.98%	65.07%	78.89%	78.42%	83.93%	100%	97.08%	77.66%	84.25%	76.76%
PlaidML - Yes - Inference - Mobilenet - OpenCL (FPS)	982.70	1371	1352	1696	1952	2009	2297	2340	2481	3227	3284	2439	3725
Normalized	26.38%	36.8%	36.29%	45.54%	52.4%	53.93%	61.66%	62.81%	66.59%	86.63%	88.16%	65.47%	100%
Standard Deviation	0.3%	0.9%	0.4%	4.7%	1.4%	0.5%	1.4%	0.9%	0.8%	0.8%	1.6%	0.2%	1.4%
PlaidML - Yes - Inference - Mobilenet - OpenCL (FPS/Watt)	19.85	28.53	33.03	33.14	34.95	41.22	36.78	36.24	43.27	49.67	41.53	45.66	43.22
Normalized	39.96%	57.44%	66.5%	66.72%	70.36%	82.99%	74.05%	72.96%	87.11%	100%	83.61%	91.93%	87.01%
PlaidML - No - Inference - Mobilenet - OpenCL (FPS)	778.99	1075	985.97	1283	1509	1580	1708	1714	1832	2406	2395	1876	2996
Normalized	26%	35.89%	32.91%	42.81%	50.38%	52.75%	57.01%	57.22%	61.15%	80.32%	79.95%	62.62%	100%
Standard Deviation	0.5%	0.8%	0.4%	0.7%	0.6%	0.5%	1.1%	0.6%	0.5%	1%	0.8%	0.4%	1%
PlaidML - No - Inference - Mobilenet - OpenCL (FPS/Watt)	14.09	19.70	20.91	21.49	23.51	25.24	25.09	24.69	28.11	29.90	26.40	31.55	29.90
Normalized	44.66%	62.44%	66.28%	68.11%	74.52%	80%	79.52%	78.26%	89.1%	94.77%	83.68%	100%	94.77%
PlaidML - No - Inference - DenseNet 201 - OpenCL (FPS)	78.97	99.49	93.61	124.27	137.81	148.07	148.55	150.94	159.34	211.01	208.22	177.04	243.50
Normalized	32.43%	40.86%	38.44%	51.03%	56.6%	60.81%	61.01%	61.99%	65.44%	86.66%	85.51%	72.71%	100%
Standard Deviation	0%	0.1%	0.2%	0.1%	0.3%	0.2%	0.1%	0.3%	0.2%	0.2%	0.2%	0.2%	0.3%
PlaidML - No - Inference - DenseNet 201 - OpenCL (FPS/Watt)	1.49	1.74	1.32	1.49	1.37	1.55	1.46	1.64	2.09	1.65	1.53	2.66	1.94
Normalized	56.02%	65.41%	49.62%	56.02%	51.5%	58.27%	54.89%	61.65%	78.57%	62.03%	57.52%	100%	72.93%
PlaidML - No - Inference - IMDB LSTM - OpenCL (FPS)	226.15	296.82	299.07	389.45	416.15	447.06	498.24	544.72	587.72	747.50	718.51	686.66	975.56
Normalized	23.18%	30.43%	30.66%	39.92%	42.66%	45.83%	51.07%	55.84%	60.24%	76.62%	73.65%	70.39%	100%
Standard Deviation	0.3%	0.2%	0.2%	0.2%	0.2%	0.1%	0.4%	0.2%	0.2%	0.2%	0.6%	0.3%	0.5%

NVIDIA Compute Comparison

PlaidML - No - Inference - IMDB LSTM - OpenCL	**3.48**	4.78	5.14	5.10	4.99	6.12	6.03	6.18	7.04	7.71	6.56	**9.36**	8.30
Normalized	37.18%	51.07%	54.91%	54.49%	53.31%	65.38%	64.42%	66.03%	75.21%	82.37%	70.09%	100%	88.68%
LeelaChessZero - OpenCL (Nodes/s)	**5925**	7324	7051	10249	11284	12723	14332	15758	17915	23269	21084	22842	**28389**
Normalized	20.87%	25.8%	24.84%	36.1%	39.75%	44.82%	50.48%	55.51%	63.11%	81.96%	74.27%	80.46%	100%
Standard Deviation	1.4%	0.5%	1.8%	1.4%	0.5%	0.8%	0.7%	0.5%	0.8%	1%	1.2%	0.4%	0.6%
LeelaChessZero - OpenCL (Nodes/s/Watt)	**55.11**	61.33	60.93	67.87	68.81	76.50	77.62	82.87	91.44	94.30	82.37	**120.64**	103.85
Normalized	45.68%	50.84%	50.51%	56.26%	57.04%	63.41%	64.34%	68.69%	75.8%	78.17%	68.28%	100%	86.08%
RedShift Demo (sec)	**1064**	764	833	479	402	373	352	342	325	247	256	240	**172**
Normalized	16.17%	22.51%	20.65%	35.91%	42.79%	46.11%	48.86%	50.29%	52.92%	69.64%	67.19%	71.67%	100%
Standard Deviation	0.2%	0.1%	0.4%	0.2%	0.1%	0.2%						0.4%	
Blender - BMW27 - NVIDIA OptiX (sec)	**170.15**	78.26	83.09	37.35	33.87	31.96	26.41	29.53	26.39	19.83	21.26	18.06	**14.96**
Normalized	8.79%	19.12%	18%	40.05%	44.17%	46.81%	56.65%	50.66%	56.69%	75.44%	70.37%	82.83%	100%
Standard Deviation	6.6%	0.1%	12.3%	0%	0.3%	0.1%	0%	33%	0.1%	0.2%	0.4%	0.2%	67.6%
Blender - Classroom - NVIDIA OptiX (sec)	**548.35**	270.19	281.98	149.31	154.25	147.16	90.51	87.26	82.60	73.91	82.31	55.95	**41.29**
Normalized	7.53%	15.28%	14.64%	27.65%	26.77%	28.06%	45.62%	47.32%	49.99%	55.87%	50.16%	73.8%	100%
Standard Deviation	0%	0.9%	0.9%	0.4%	0.3%	0%	0.1%	0.2%	0.2%	0.3%	0.7%	2.4%	0.3%
Blender - Fishy Cat - NVIDIA OptiX (sec)	**344.25**	165.55	168.18	68.22	63.22	58.17	48.84	45.98	43.57	33.09	35.12	37.24	**22.73**
Normalized	6.6%	13.73%	13.52%	33.32%	35.95%	39.08%	46.54%	49.43%	52.17%	68.69%	64.72%	61.04%	100%
Standard Deviation	0%	0.1%	0.1%	0.1%	0.4%	0.1%	0%	0.1%	0.1%	0.1%	0.6%	0%	0.4%
Blender - Pabellon Barcelona - NVIDIA OptiX (sec)	**973.87**	476.55	489.37	210.22	209.05	198.24	135.34	135.02	130.28	104.80	114.00	86.20	**59.14**
Normalized	6.07%	12.41%	12.08%	28.13%	28.29%	29.83%	43.7%	43.8%	45.39%	56.43%	51.88%	68.61%	100%
Standard Deviation	0%	0.2%	0.1%	0.1%	0.2%	0.1%	0.1%	0.1%	0.1%	0.3%	1%	0.1%	0.2%
Blender - Barbershop - NVIDIA OptiX (sec)		2594	**2732**	1783	1878	1804	1002	974.80	917.27	902.94	1003	581.54	**458.51**
Normalized		17.68%	16.78%	25.71%	24.42%	25.42%	45.74%	47.04%	49.99%	50.78%	45.72%	78.84%	100%
Standard Deviation		0%	0.6%	0.4%	0.3%	0.2%	0.1%	0.1%	0%	0.3%	0.2%	0.5%	0.3%

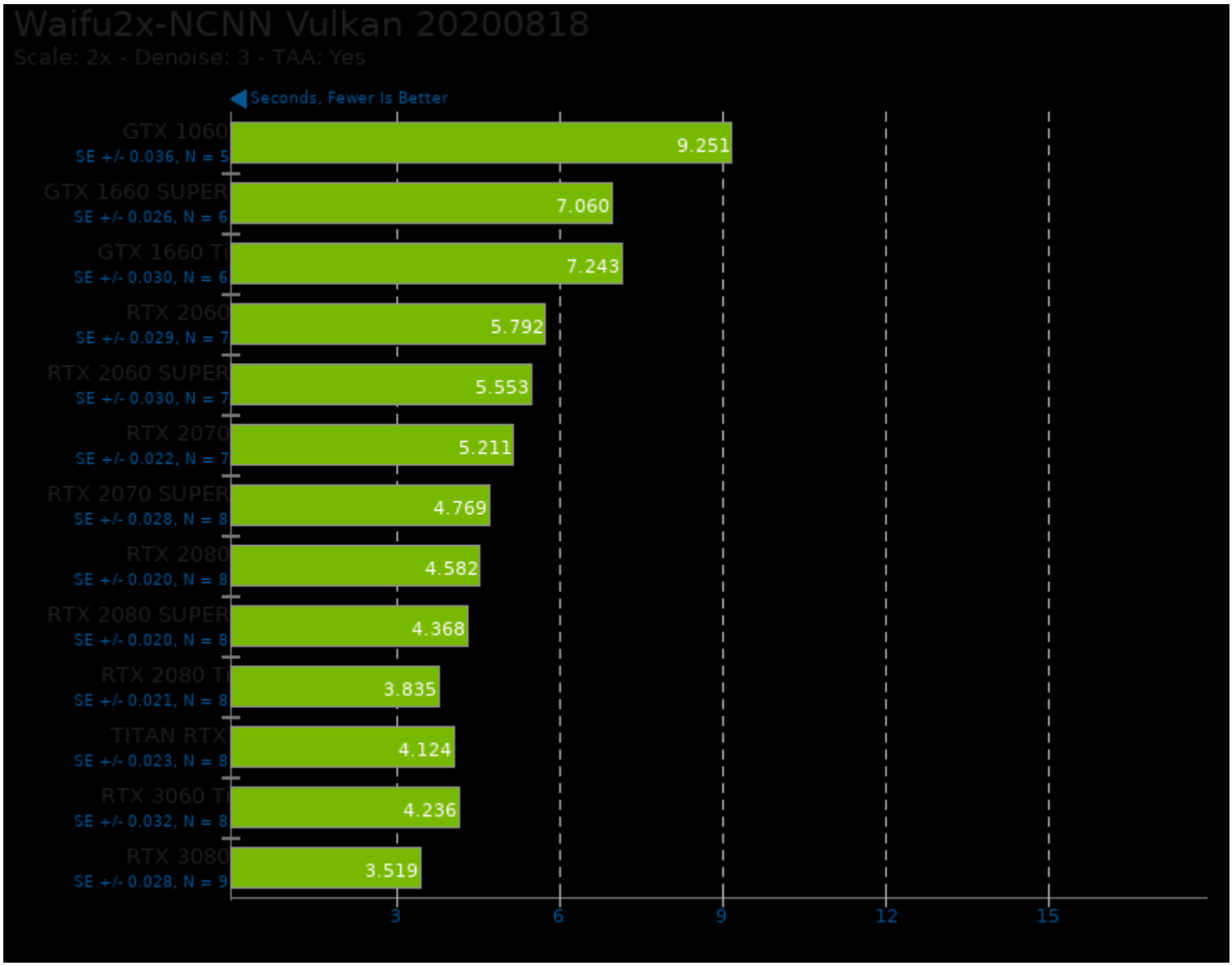
NVIDIA Compute Comparison

VkFFT (Benchmark Score)	12788	18450	17097	20883	24975	26600	27682	28564	30720	37384	36933	32065	49631
Normalized	25.77%	37.17%	34.45%	42.08%	50.32%	53.6%	55.78%	57.55%	61.9%	75.32%	74.42%	64.61%	100%
Standard Deviation	0.1%	0.3%	0.2%	0.2%	0.4%	0.1%	0.4%	0.4%	0.3%	0.4%	0.6%	0.1%	0.6%
VkFFT (Benchmark Score/Watt)	188.54	227.18	241.67	235.12	250.53	286.99	264.03	253.77	281.33	287.99	261.32	328.58	329.04
Normalized	57.3%	69.04%	73.45%	71.46%	76.14%	87.22%	80.24%	77.12%	85.5%	87.52%	79.42%	99.86%	100%
RealSR-NCNN - 4x - Yes (sec)	144.628	120.907	123.848	86.602	80.587	74.806	63.754	60.095	54.783	44.725	45.553	52.468	35.720
Normalized	24.7%	29.54%	28.84%	41.25%	44.32%	47.75%	56.03%	59.44%	65.2%	79.87%	78.41%	68.08%	100%
Standard Deviation	0.3%	0.2%	0.2%	0.5%	0.7%	1%	0.5%	0.9%	0.4%	0.6%	0.7%	0.2%	0.8%
RealSR-NCNN - 4x - No (sec)	20.128	17.214	17.733	12.936	12.377	11.537	10.206	9.611	9.031	7.743	8.009	8.633	6.576
Normalized	32.67%	38.2%	37.08%	50.83%	53.13%	57%	64.43%	68.42%	72.82%	84.93%	82.11%	76.17%	100%
Standard Deviation	0.1%	0.3%	0.3%	0.2%	0.3%	0.2%	0.7%	0.8%	0.7%	0.4%	0.8%	0.6%	0.5%
IndigoBench - OpenCL GPU - Supercar (M samples/s)	10.282	15.241	14.304	18.252	21.666	23.430	24.490	24.825	25.478	33.190	31.757	33.520	43.589
Normalized	23.59%	34.97%	32.82%	41.87%	49.71%	53.75%	56.18%	56.95%	58.45%	76.14%	72.86%	76.9%	100%
Standard Deviation	0.2%	0.4%	0.1%	0.1%	0.7%	0.1%	0.1%	0%	0.5%	0.7%	0.7%	0.1%	0.9%
IndigoBench - OpenCL GPU - Supercar (M samples/s/Watt	0.16	0.16	0.18	0.17	0.17	0.18	0.18	0.18	0.18	0.17	0.15	0.23	0.19
Normalized	69.57%	69.57%	78.26%	73.91%	73.91%	78.26%	78.26%	78.26%	78.26%	73.91%	65.22%	100%	82.61%
IndigoBench - OpenCL GPU - Bedroom (M samples/s)	3.547	4.662	4.360	5.534	6.865	7.394	7.677	7.711	7.884	10.913	10.588	11.394	16.595
Normalized	21.37%	28.09%	26.27%	33.35%	41.37%	44.56%	46.26%	46.47%	47.51%	65.76%	63.8%	68.66%	100%
Standard Deviation	0.1%	0.1%	0%	0.1%	0.2%	0%	0.2%	0.2%	0.1%	0.2%	0.1%	0%	0.3%
IndigoBench - OpenCL GPU - Bedroom (M samples/s/Watt	0.05	0.05	0.05	0.05	0.05	0.06	0.05	0.05	0.06	0.05	0.05	0.07	0.07
Normalized	71.43%	71.43%	71.43%	71.43%	71.43%	85.71%	71.43%	71.43%	85.71%	71.43%	71.43%	100%	100%
Geekbench - GPU OpenCL (Score)	36798	64680	64871	80712	87076	93805	105899	114773	124272	152583	151148	132421	197267
Normalized	18.65%	32.79%	32.88%	40.92%	44.14%	47.55%	53.68%	58.18%	63%	77.35%	76.62%	67.13%	100%
Standard Deviation	1%	1.5%	1.1%	1.7%	1.6%	1.2%	0.9%	0.3%	1.4%	0.3%	2%	1.7%	0.6%
Geekbench - GPU OpenCL (Score/Watt)	766.73	1297	1731	1474	1458	1631	1659	1613	1855	1962	1558	2278	1937
Normalized	33.66%	56.93%	75.98%	64.7%	63.98%	71.6%	72.81%	70.81%	81.44%	86.13%	68.37%	100%	85%

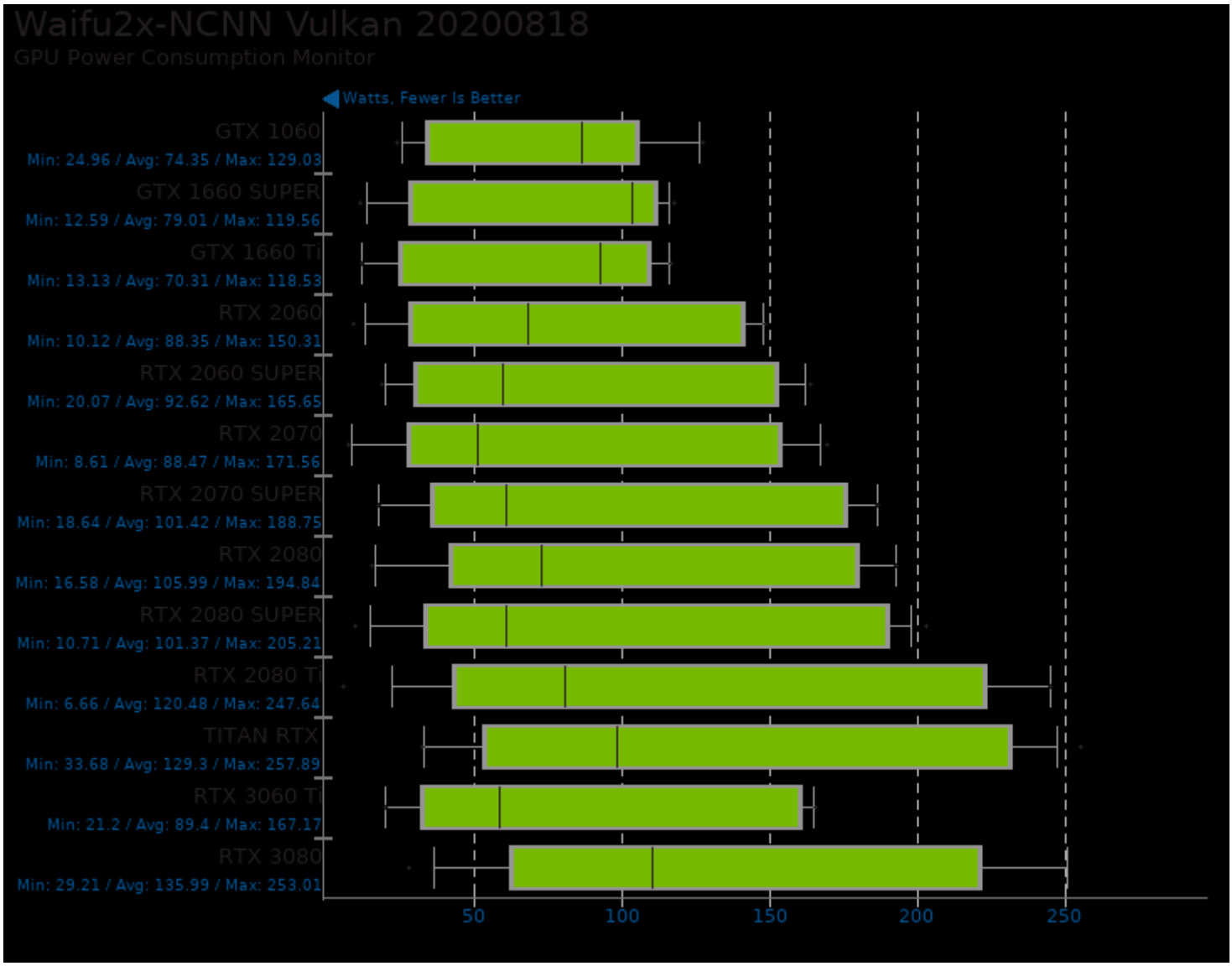
NVIDIA Compute Comparison

Geekbench - GPU NVIDIA CUDA (Score)	**33671**	66387	67003	83535	90572	99664	110450	121856	128277	167858	155867	136797	**208331**
Normalized	16.16%	31.87%	32.16%	40.1%	43.48%	47.84%	53.02%	58.49%	61.57%	80.57%	74.82%	65.66%	100%
Standard Deviation	0.5%	1%	0.3%	0.9%	1.3%	1.2%	0.8%	0.9%	2.4%	1.3%	4.2%	1.1%	4.2%
Geekbench - GPU NVIDIA CUDA (Score/Watt)	**592.62**	1208	1500	1314	1422	1524	1590	1752	1816	1927	1603	**2140**	1916
Normalized	27.69%	56.44%	70.08%	61.41%	66.45%	71.2%	74.32%	81.86%	84.85%	90.07%	74.89%	100%	89.54%
Geekbench - GPU Vulkan (Score)	**37844**	60351	59063	72689	75750	85125	96082	98487	108359	132489	128003	112321	**158724**
Normalized	23.84%	38.02%	37.21%	45.8%	47.72%	53.63%	60.53%	62.05%	68.27%	83.47%	80.65%	70.76%	100%
Standard Deviation	1.5%	1.2%	2.2%	2%	0.8%	0.9%	2.4%	2%	3%	3.7%	3.6%	3.2%	3.1%
Geekbench - GPU Vulkan (Score/Watt)	**715.07**	1127	1281	1275	1117	1608	1469	1363	1486	1593	1301	**1806**	1503
Normalized	39.59%	62.38%	70.93%	70.59%	61.82%	89.05%	81.34%	75.45%	82.28%	88.19%	72.05%	100%	83.21%

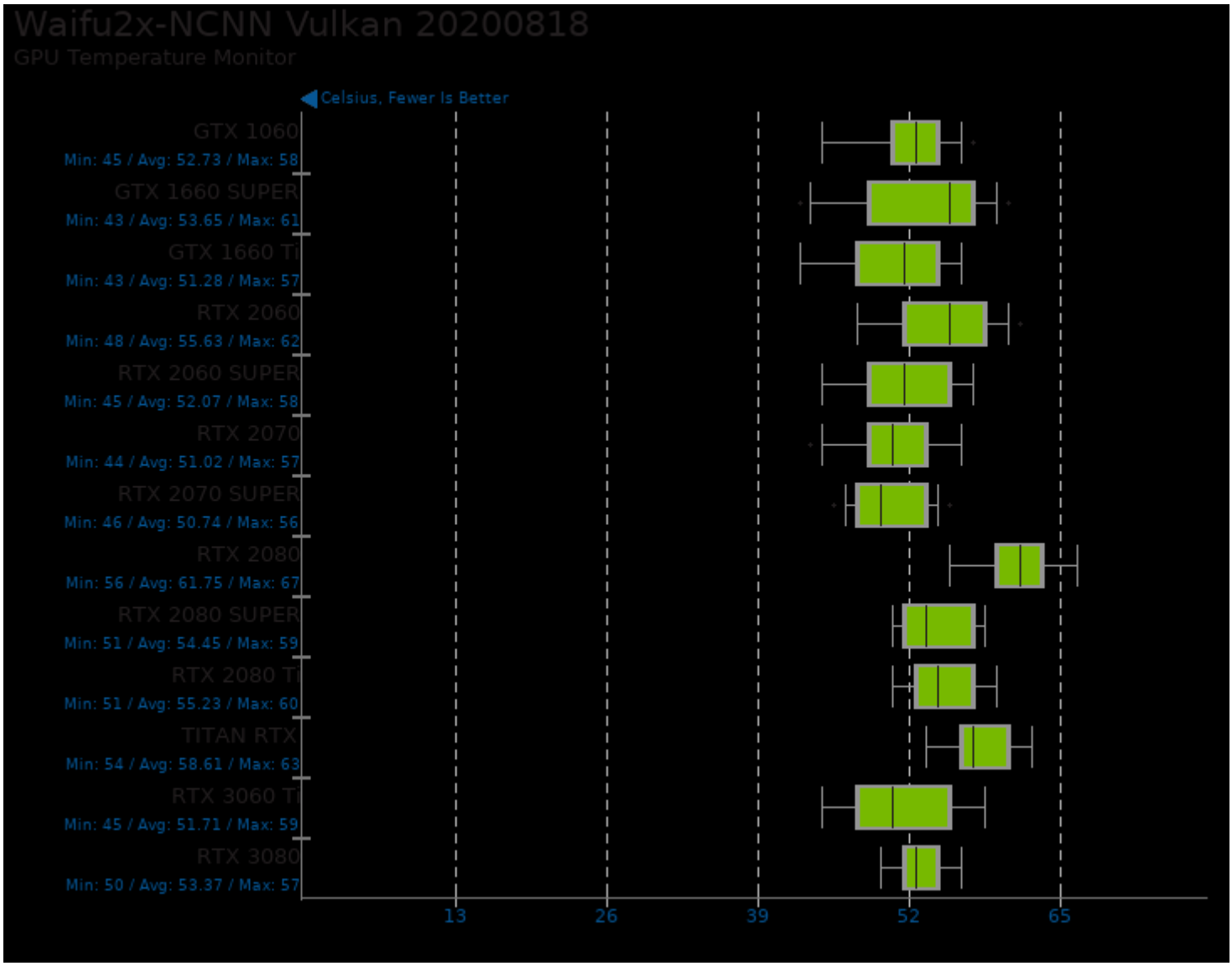
NVIDIA Compute Comparison



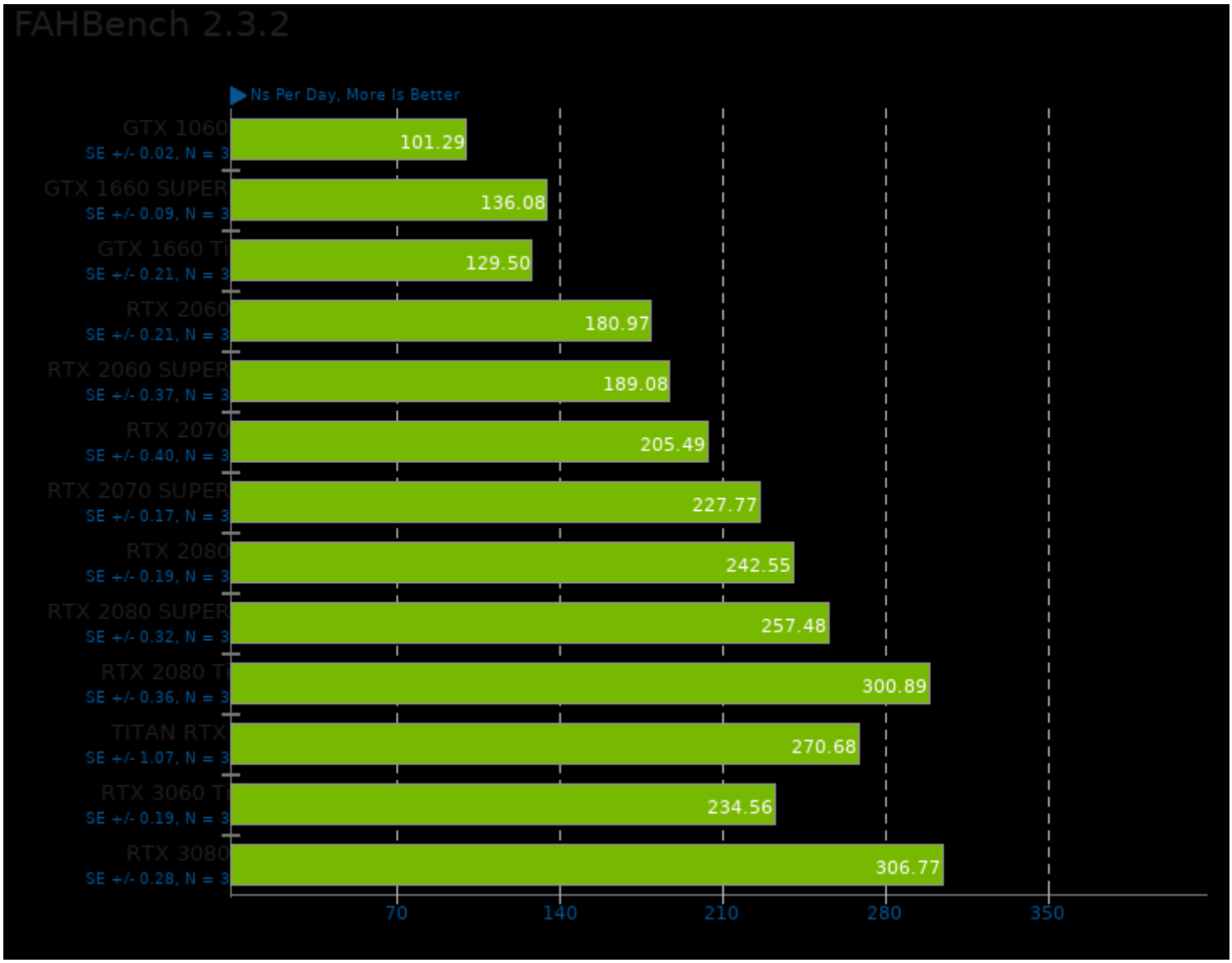
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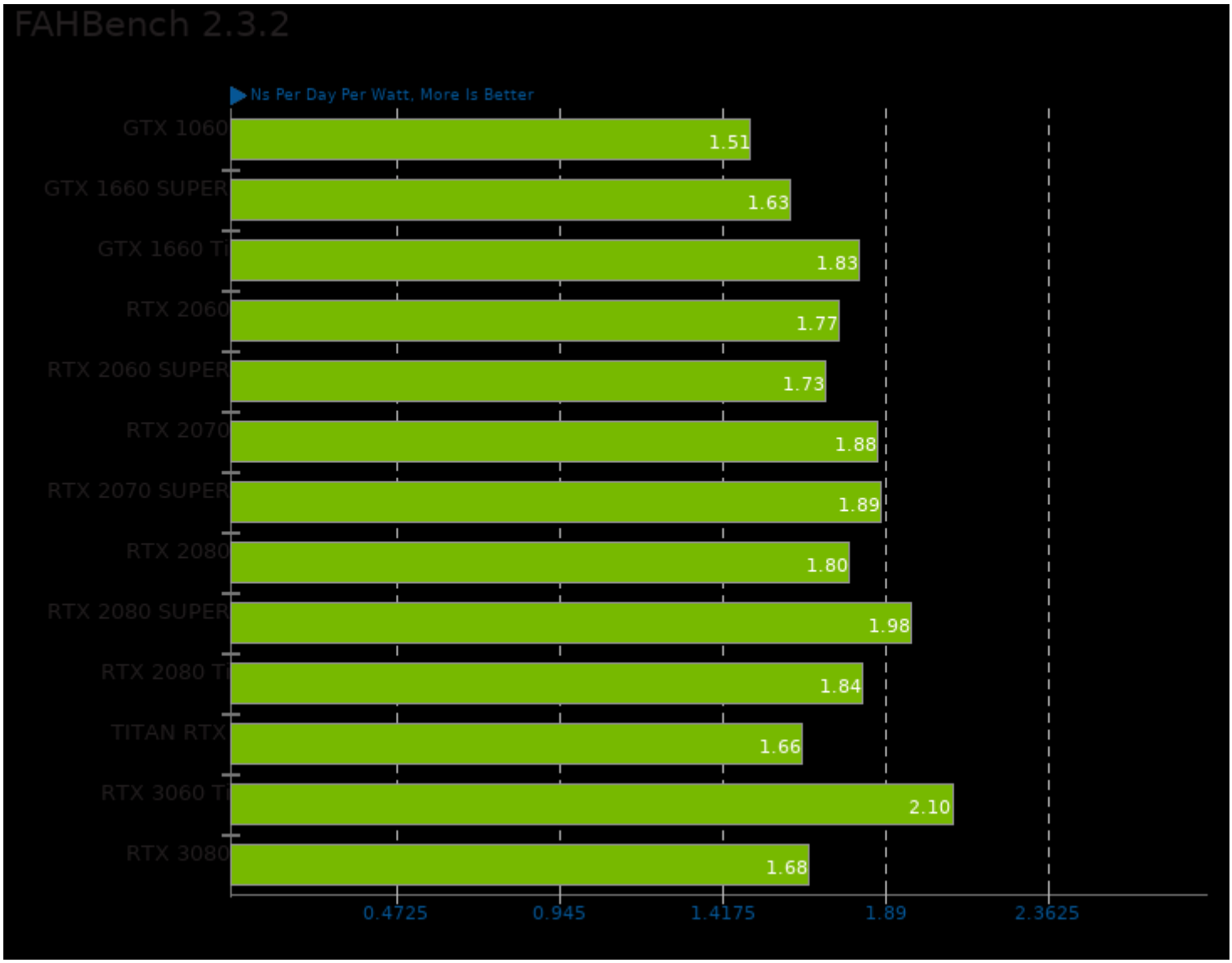
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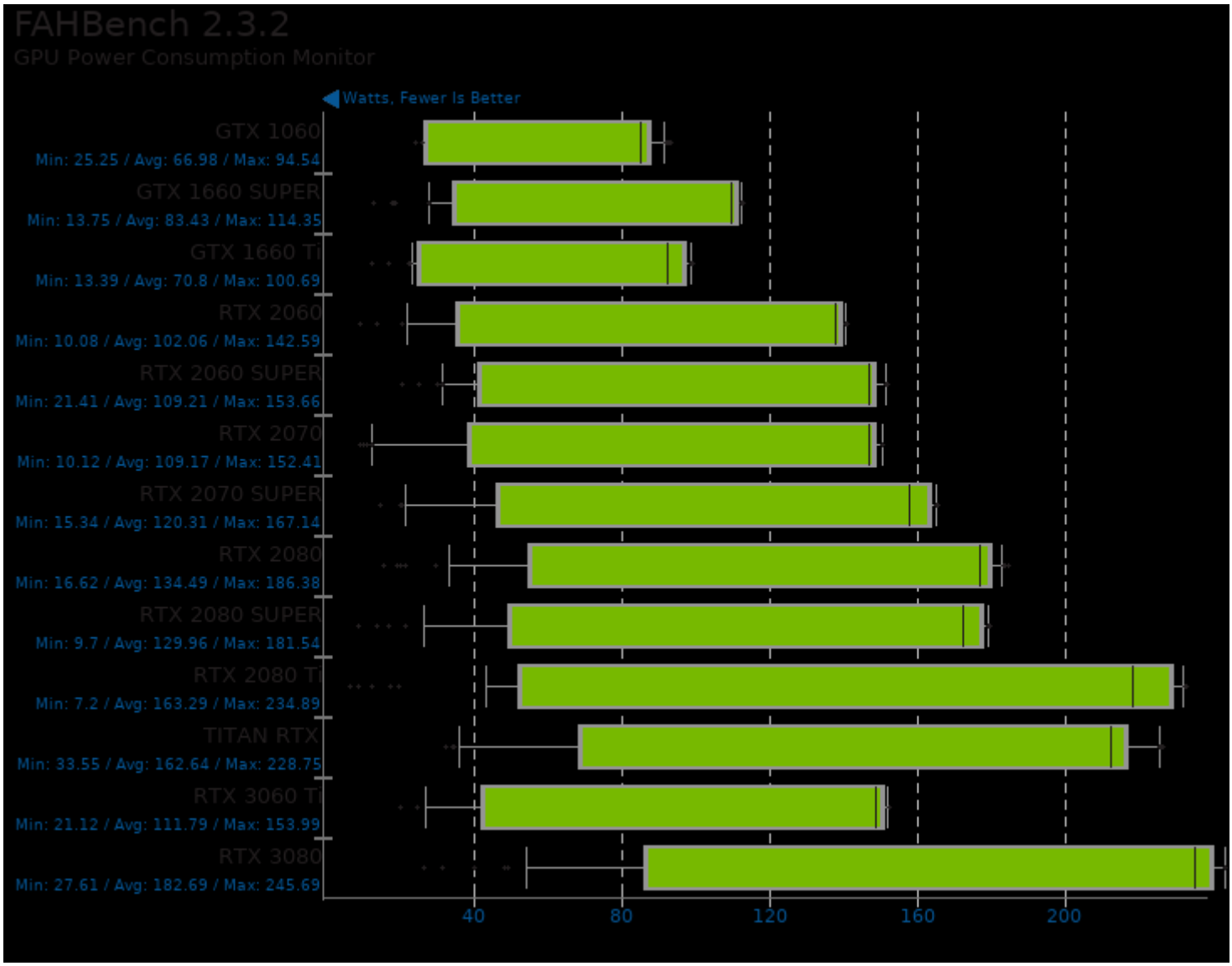
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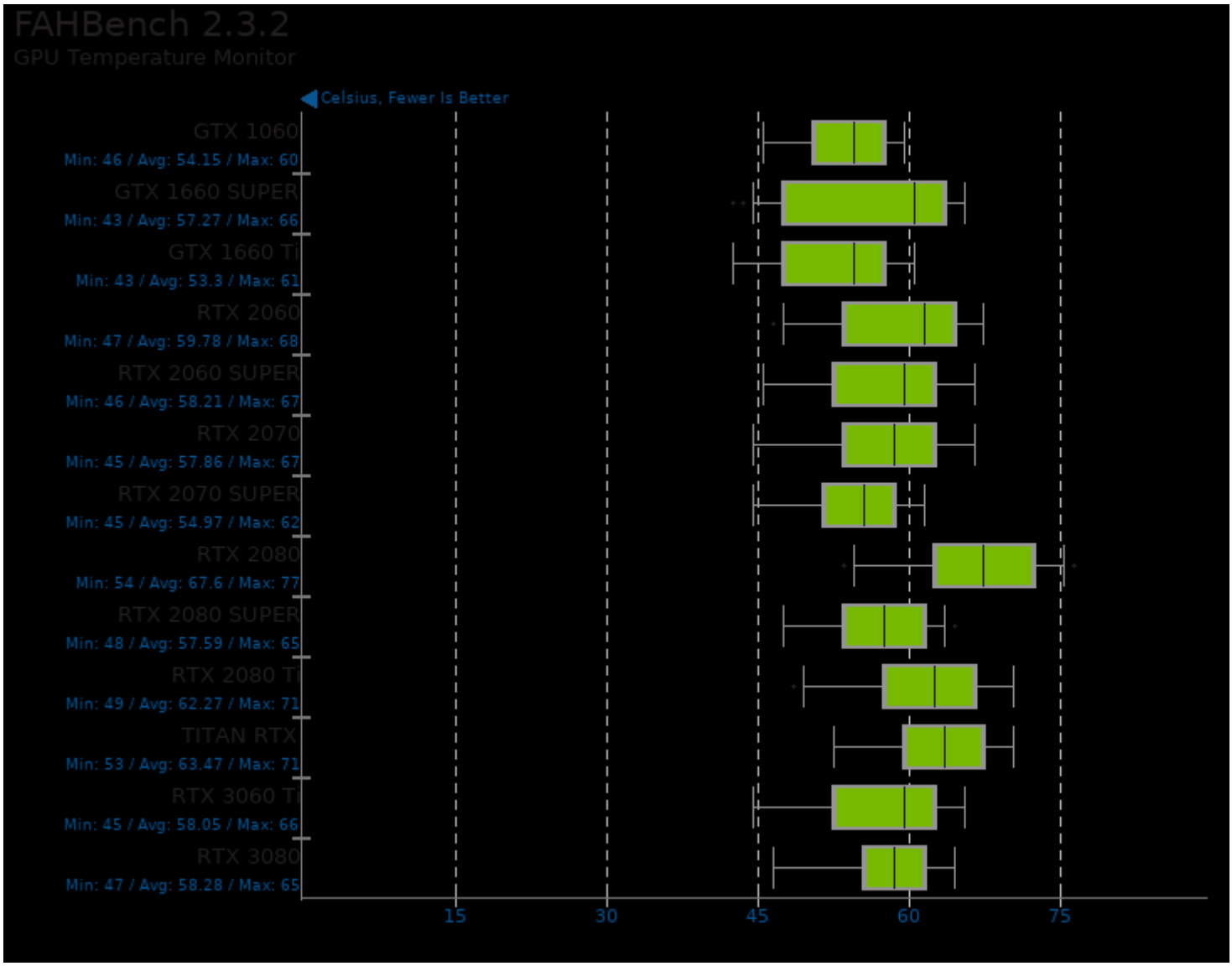
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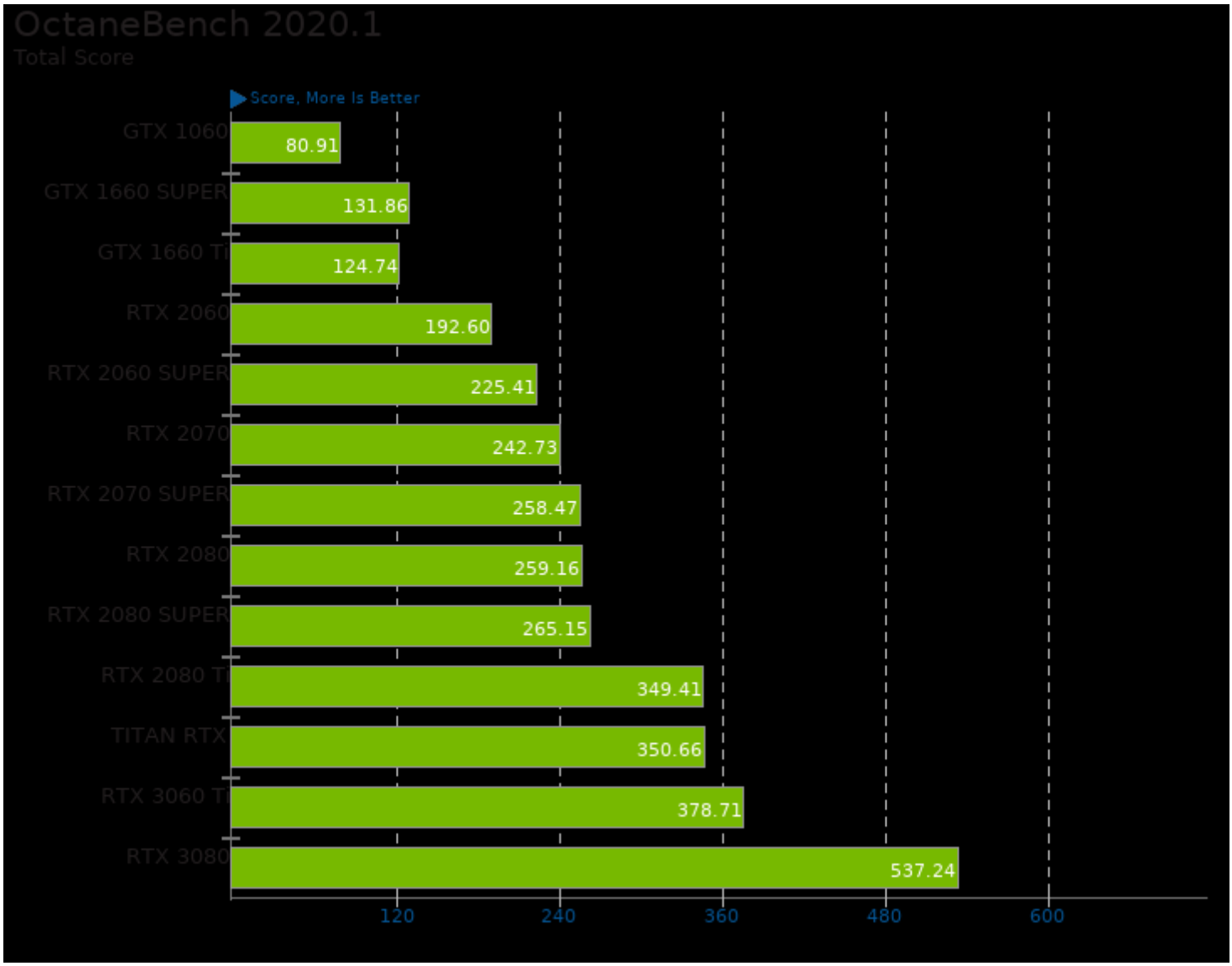
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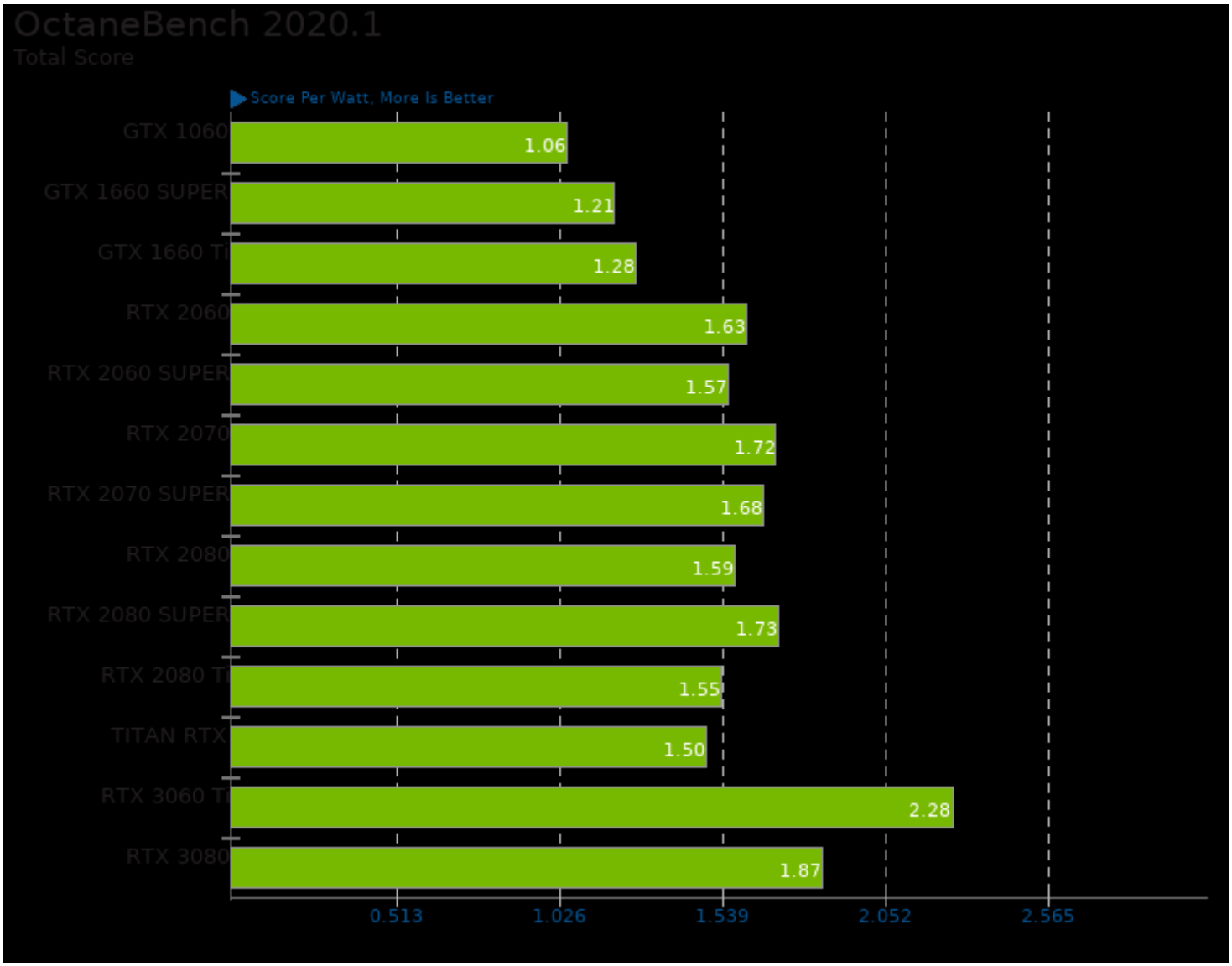
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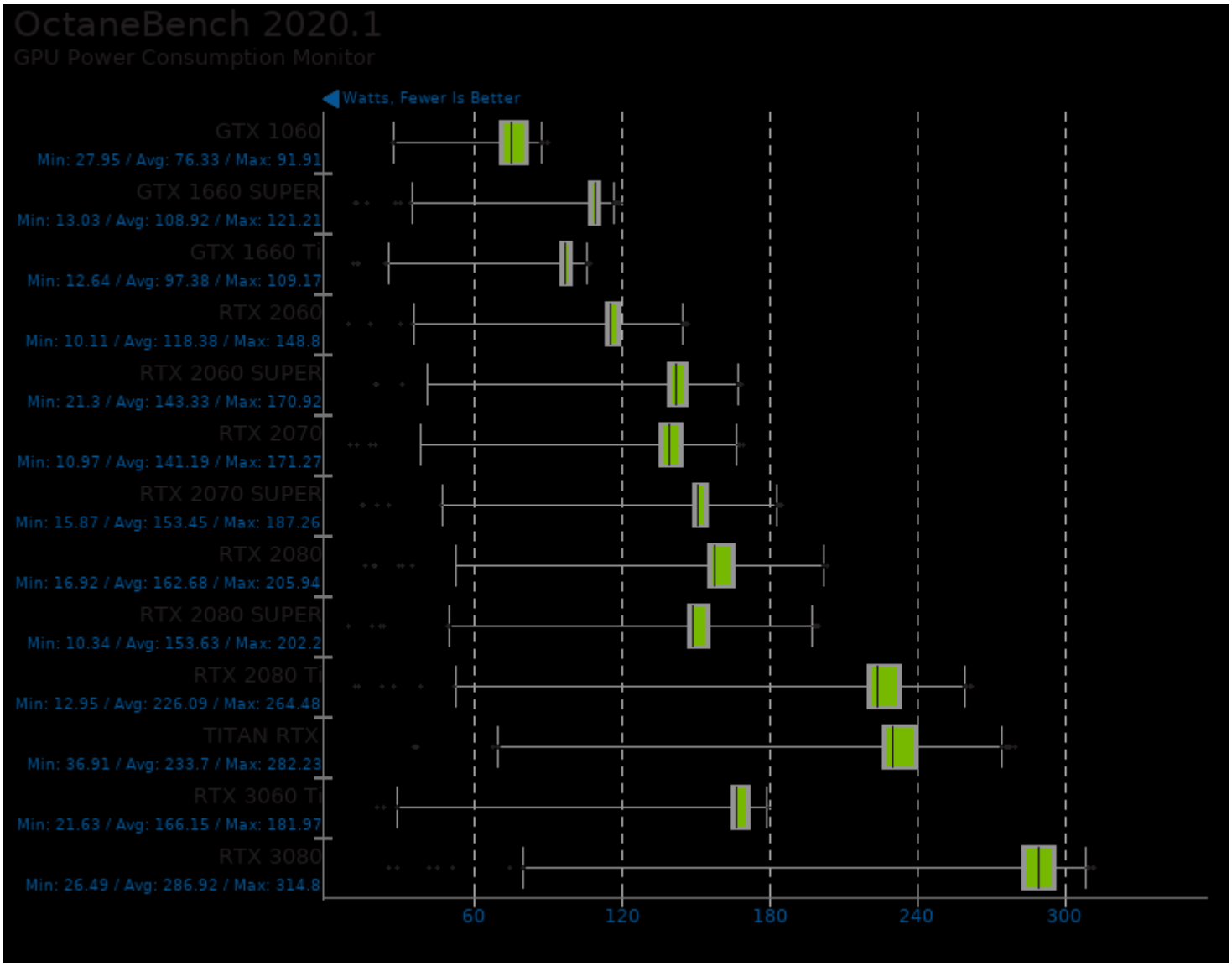
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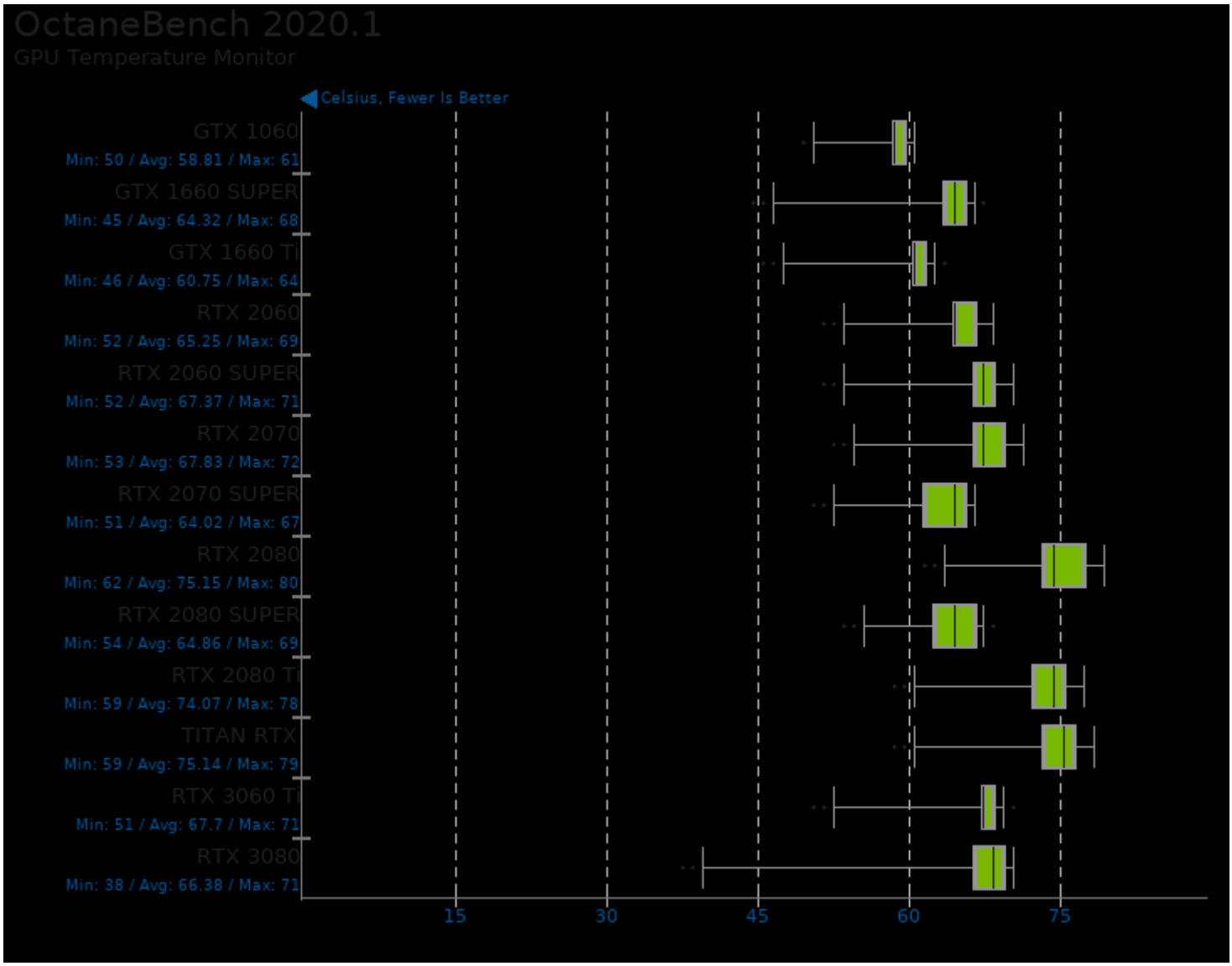
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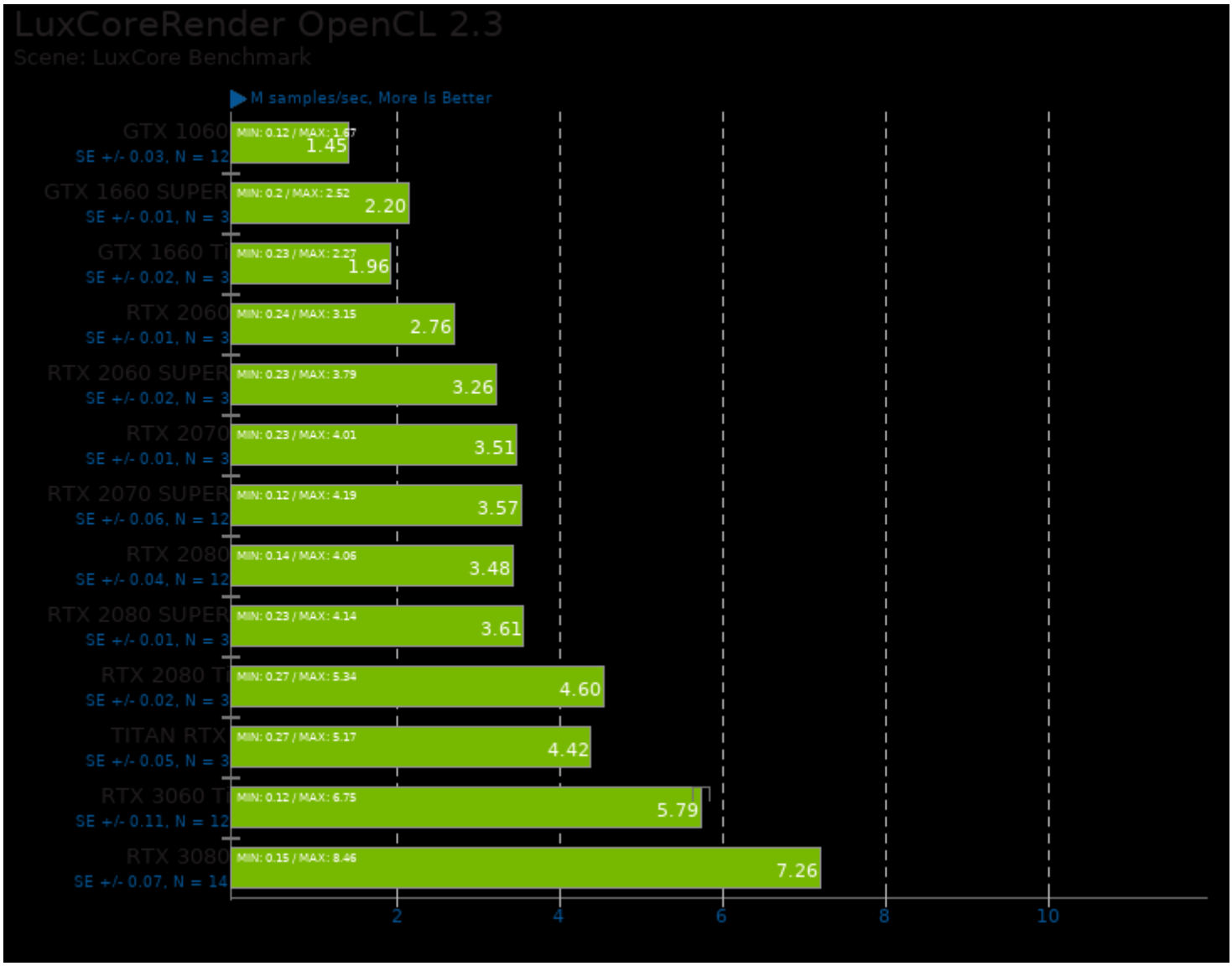
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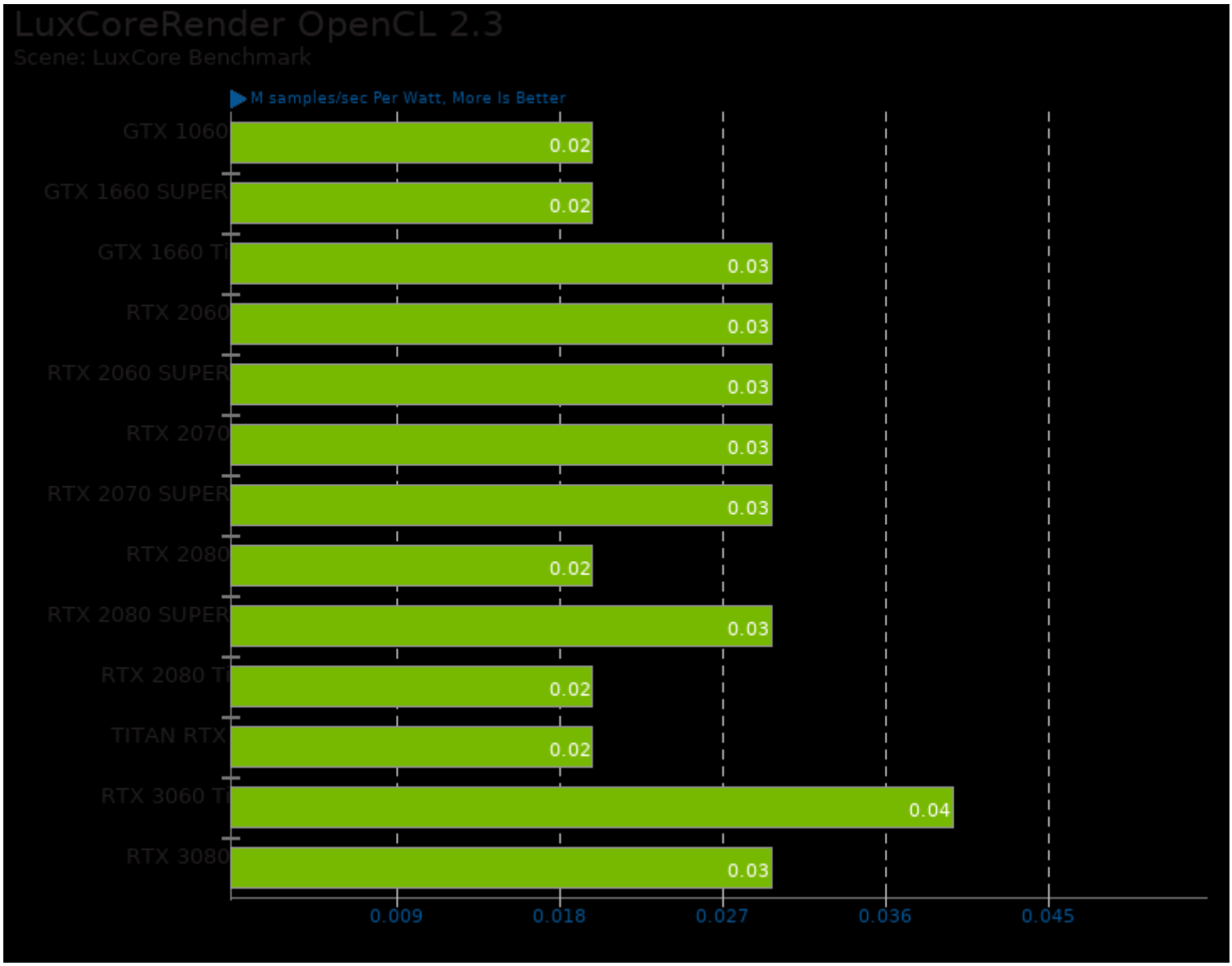
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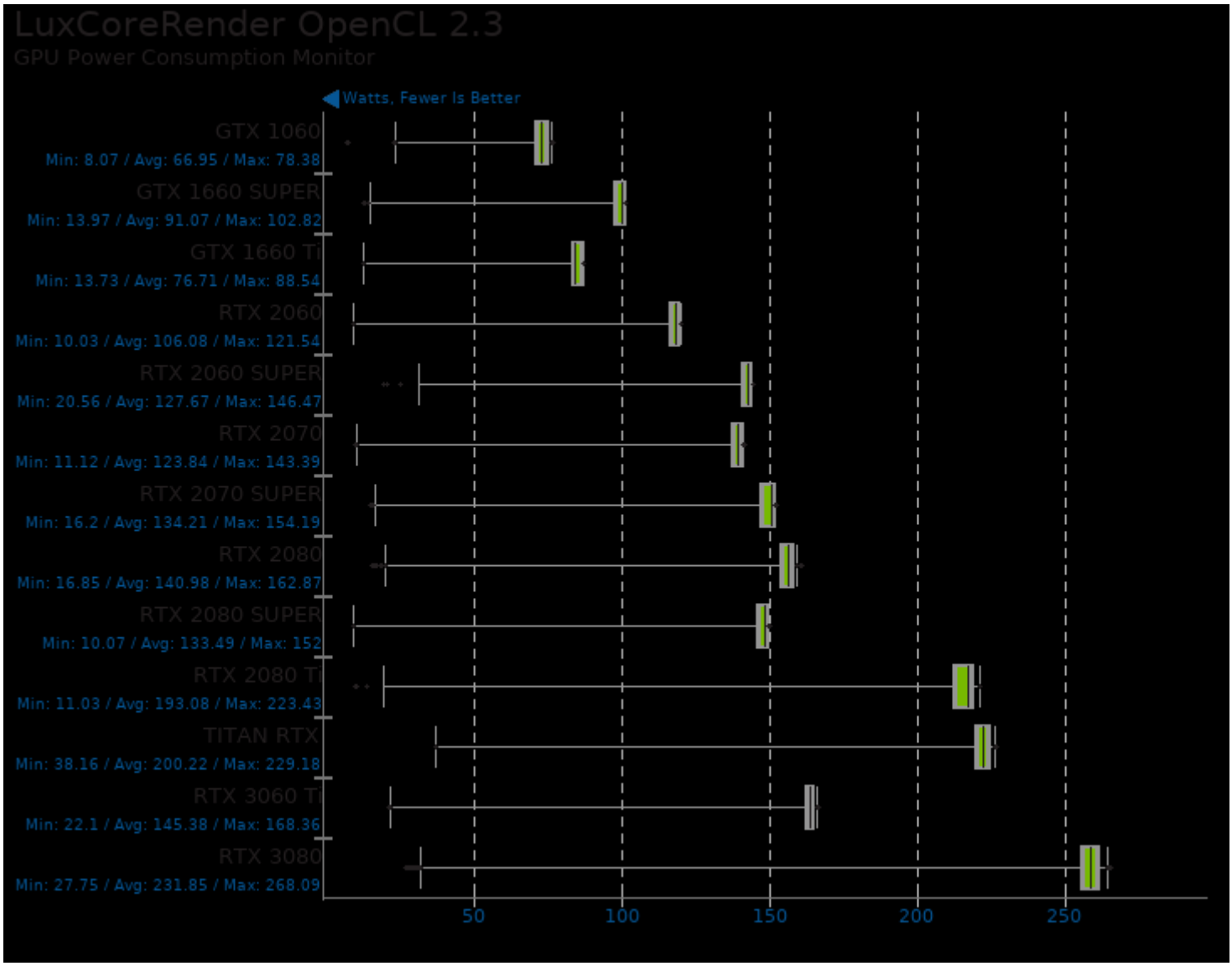
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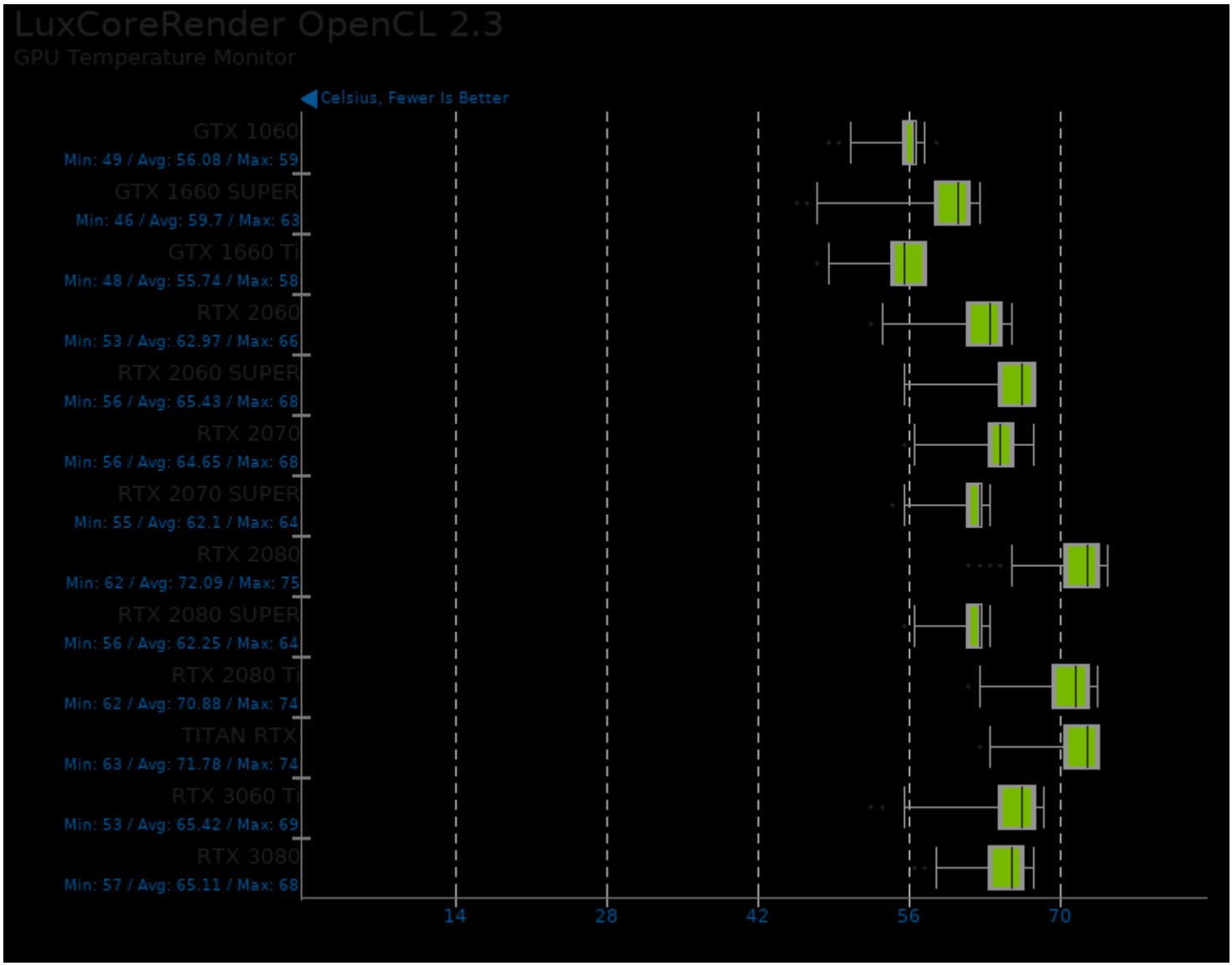
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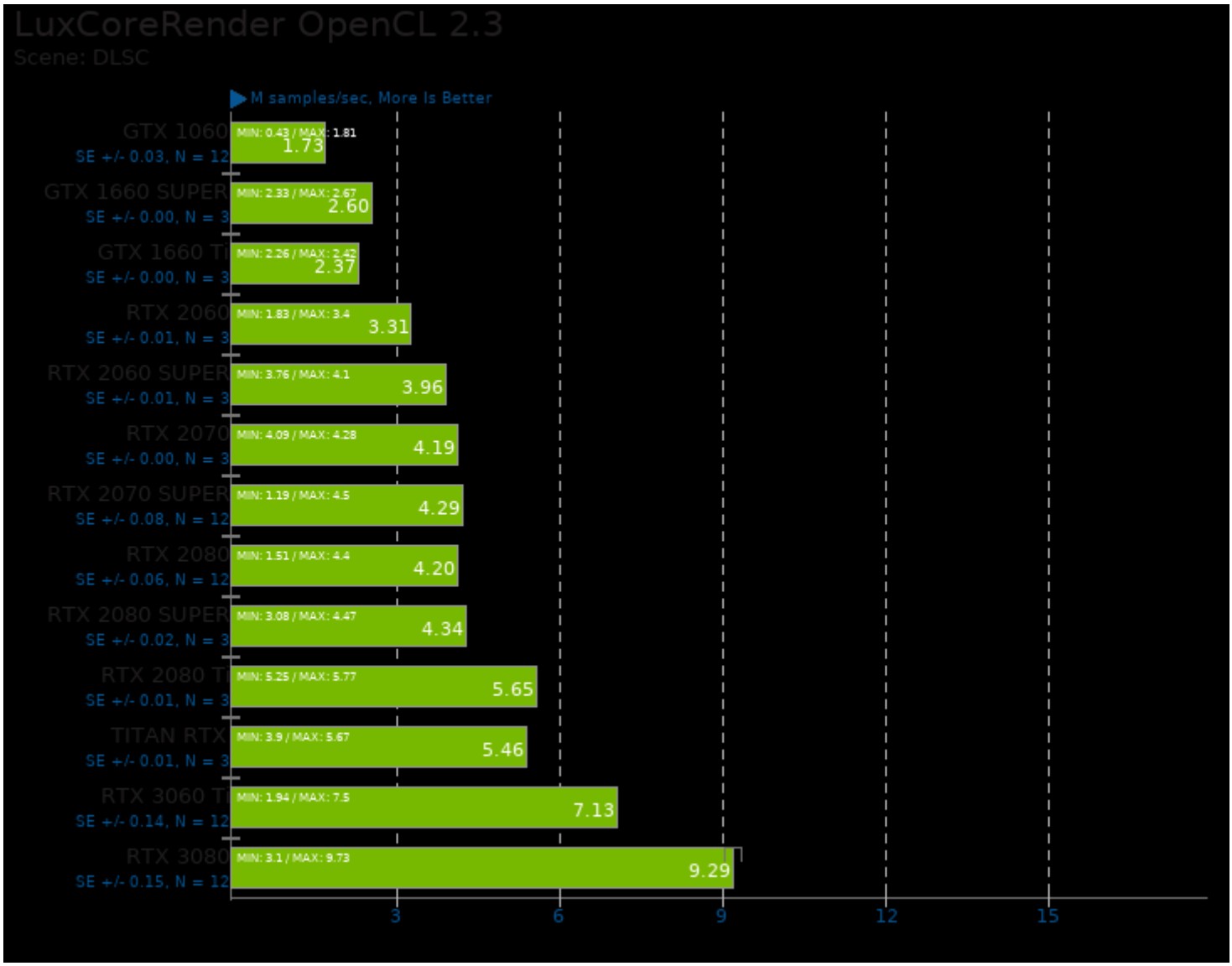
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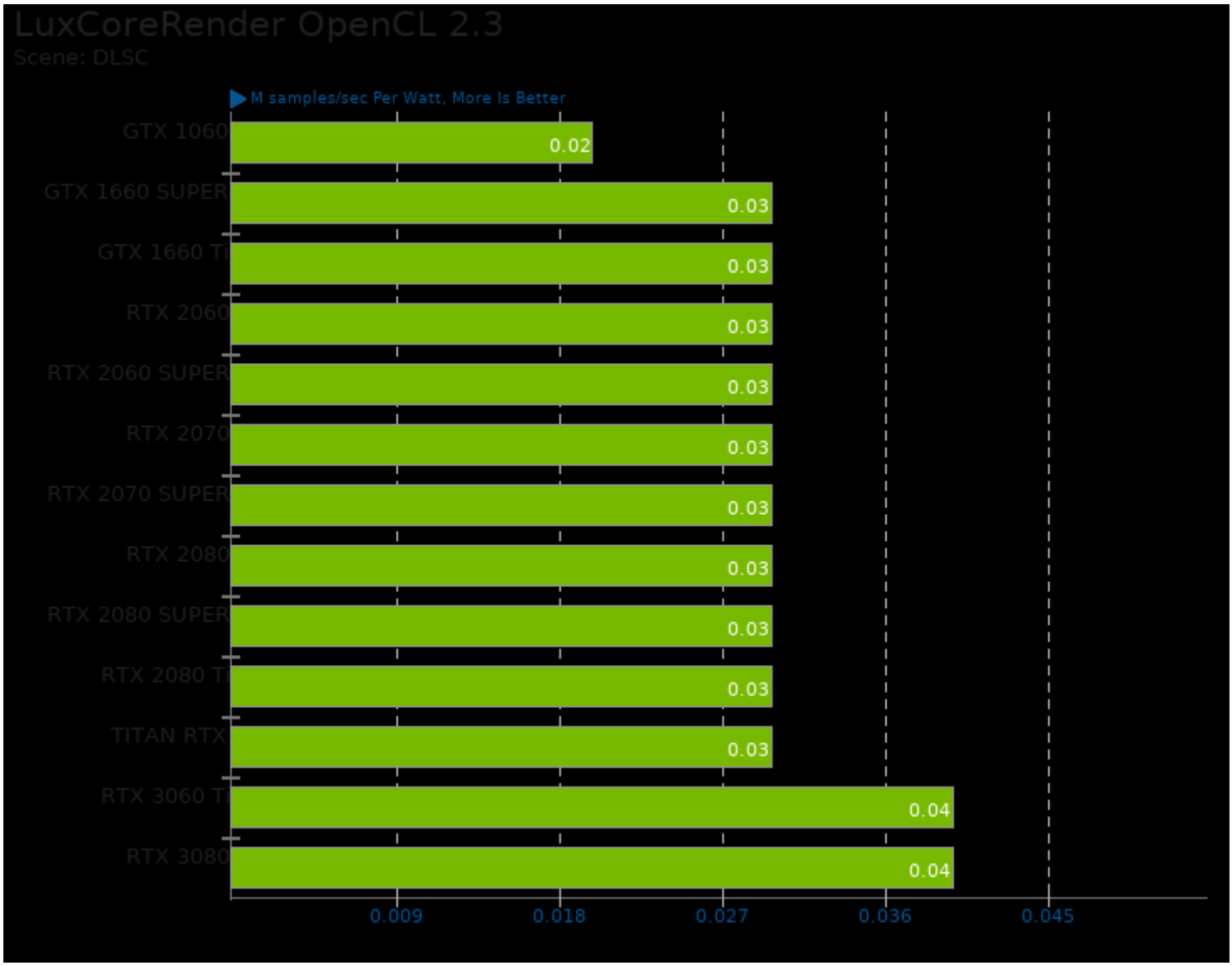
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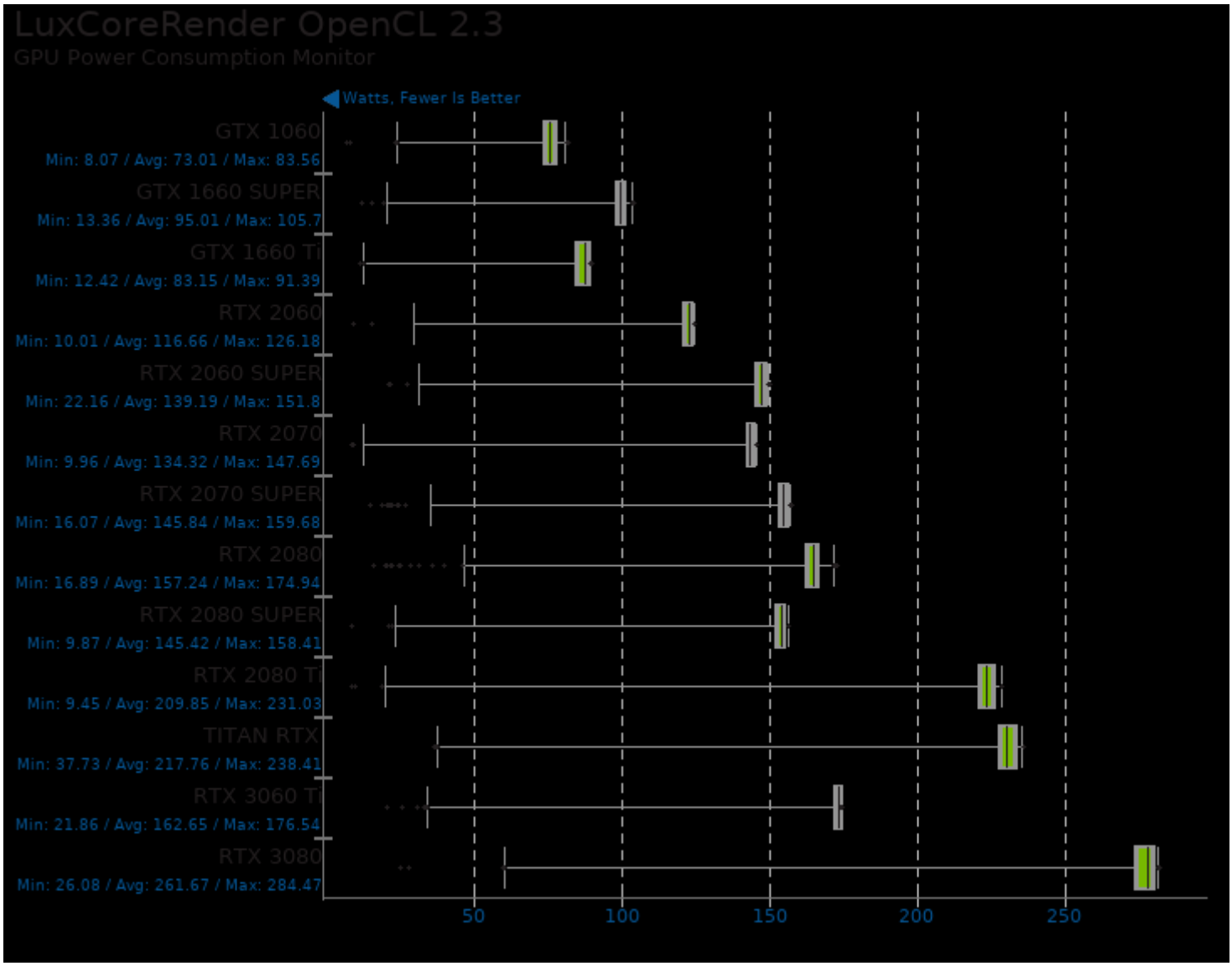
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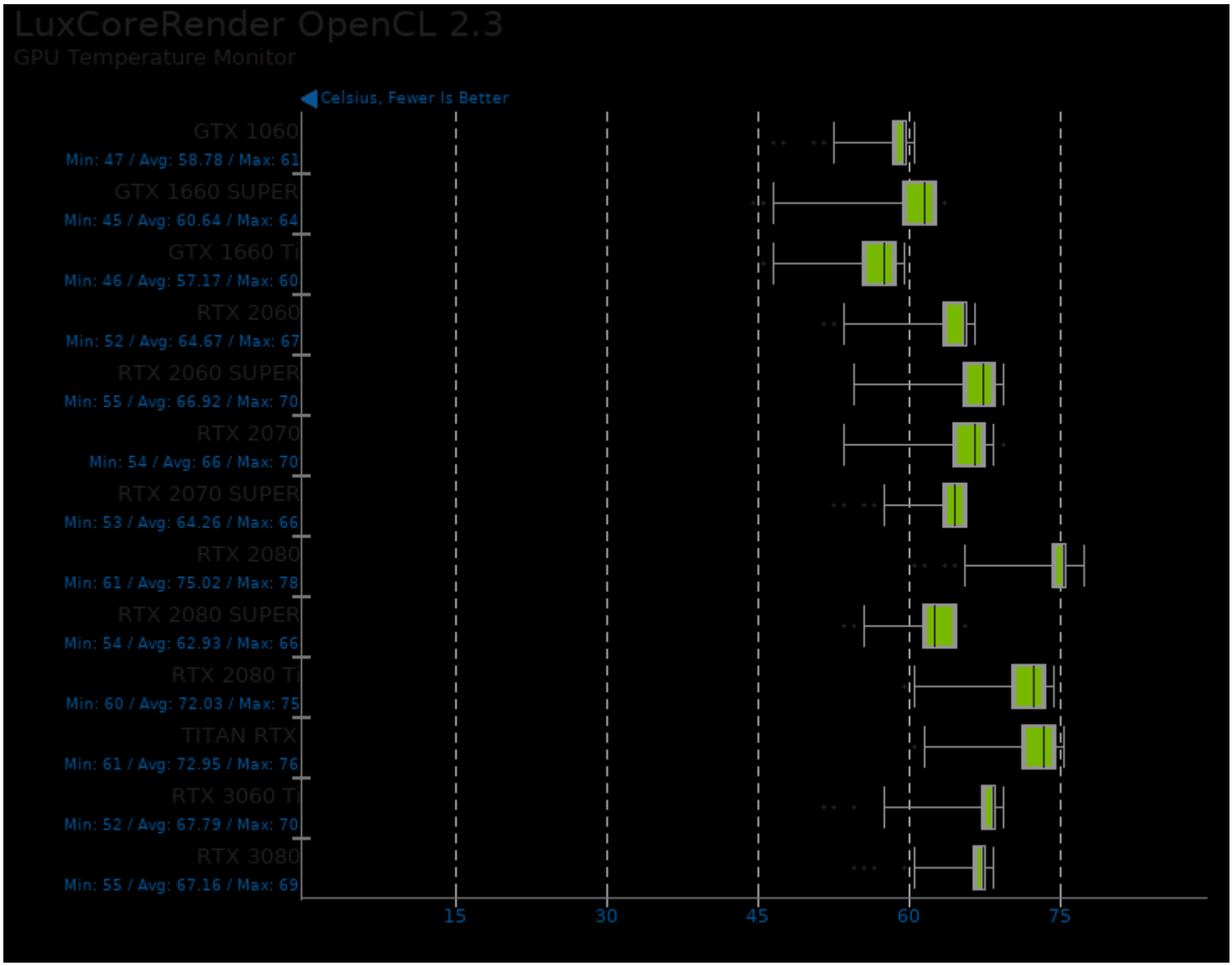
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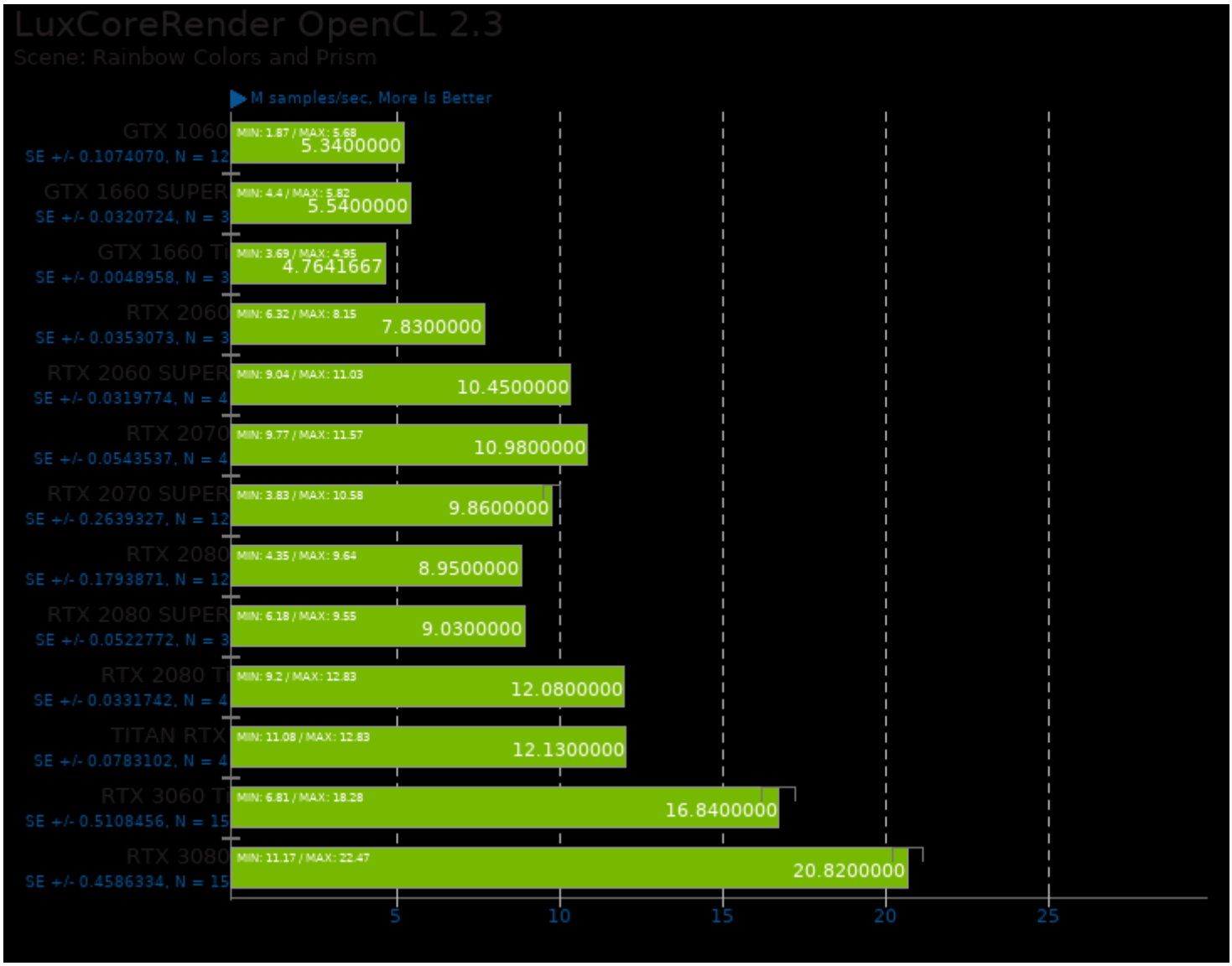
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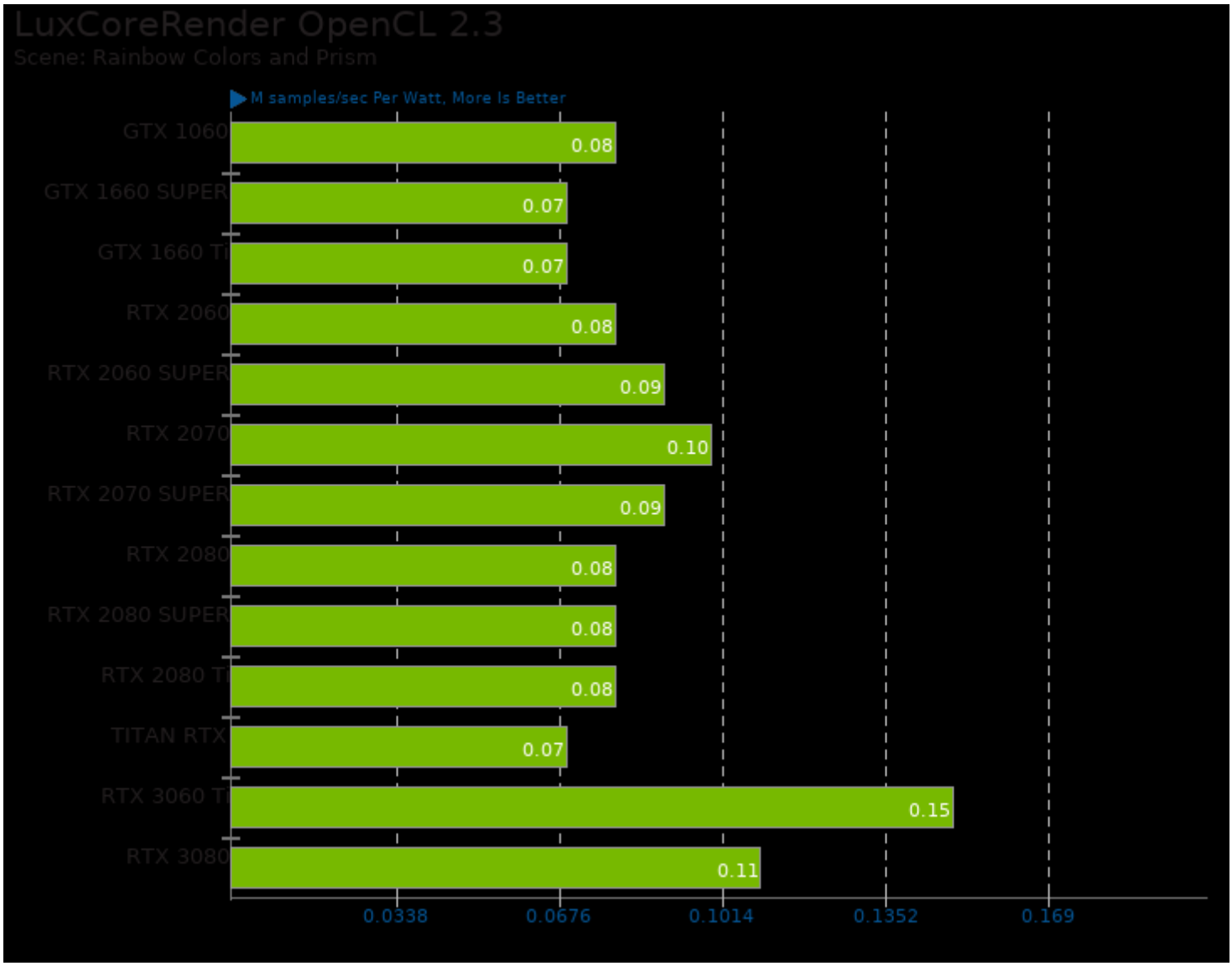
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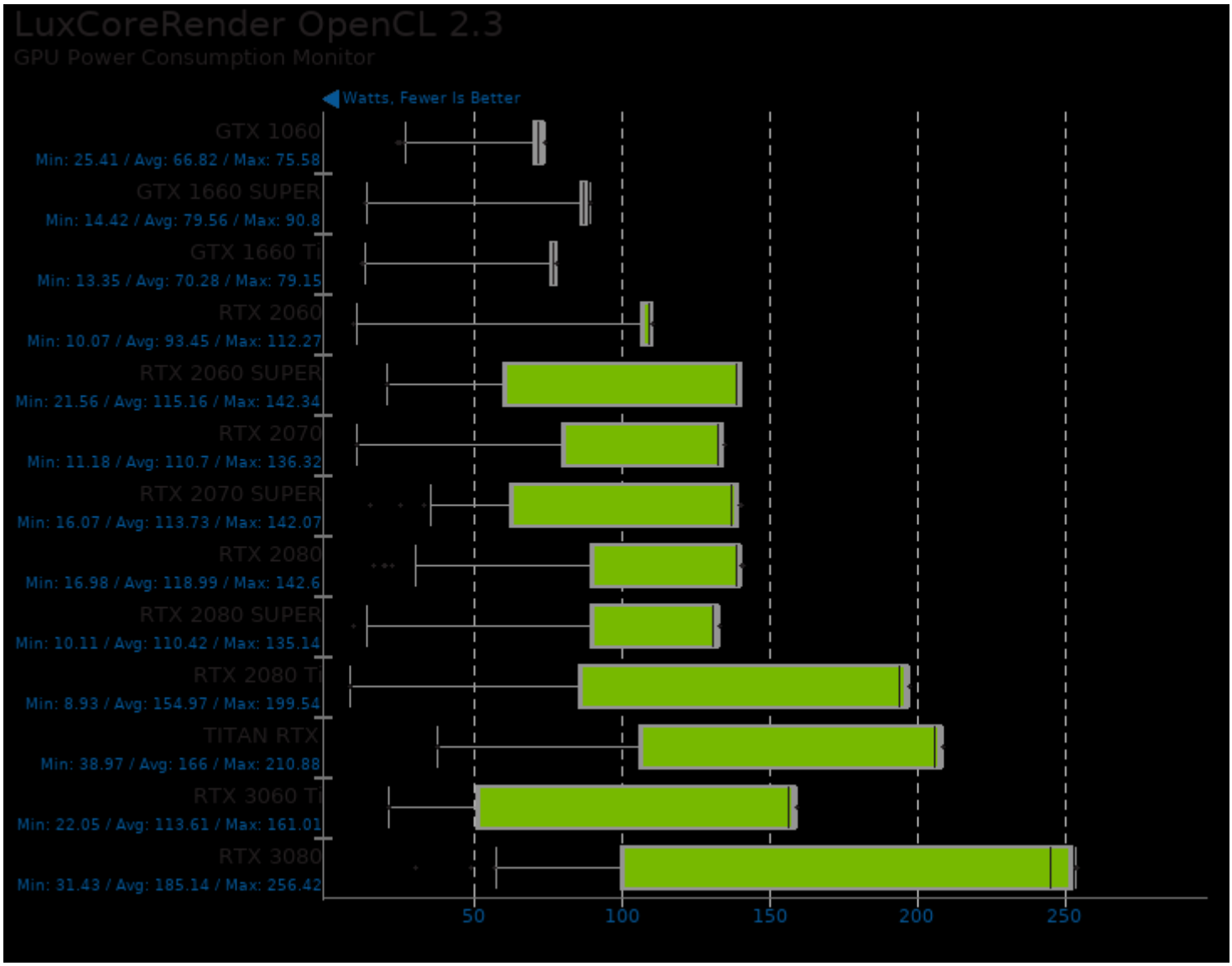
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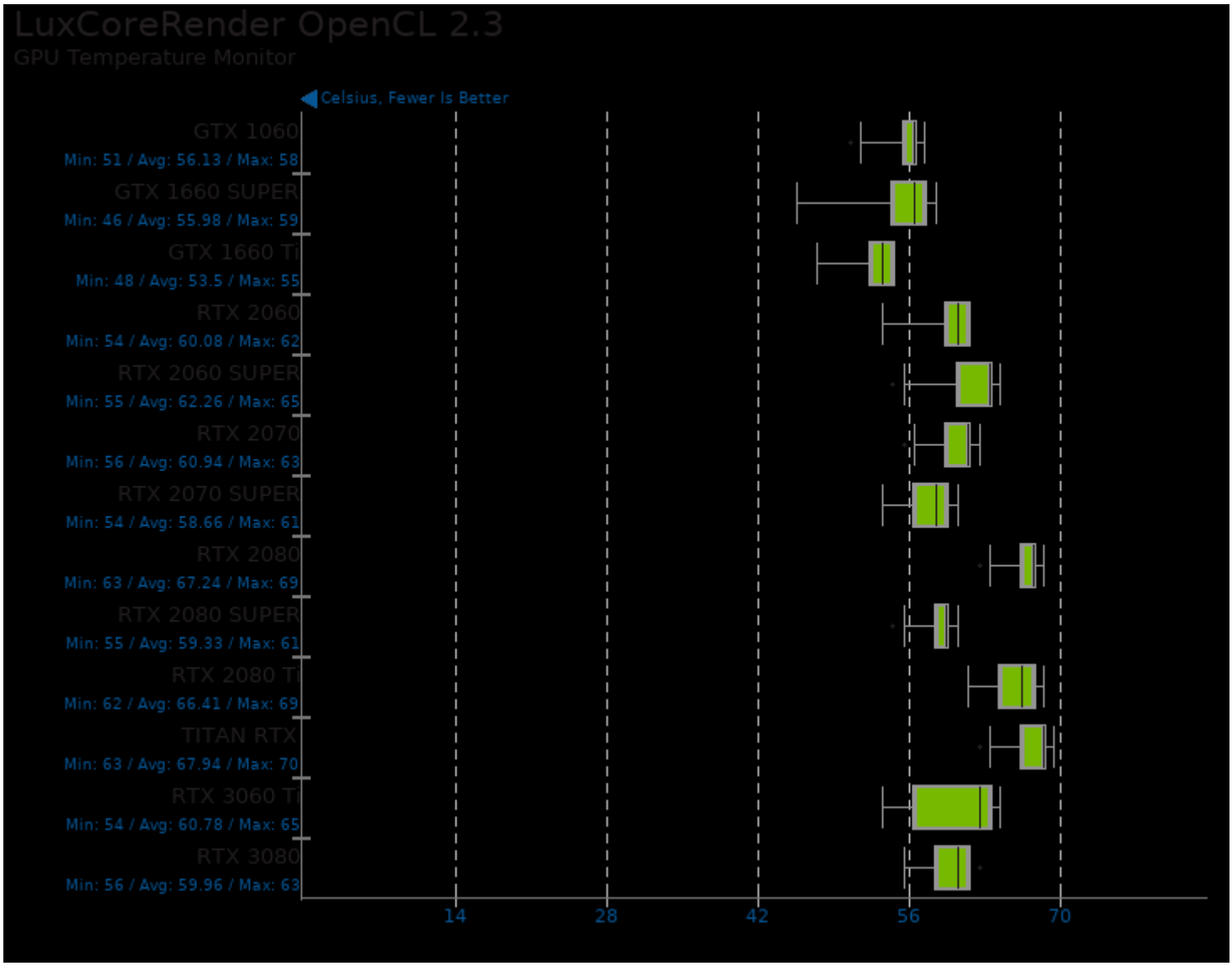
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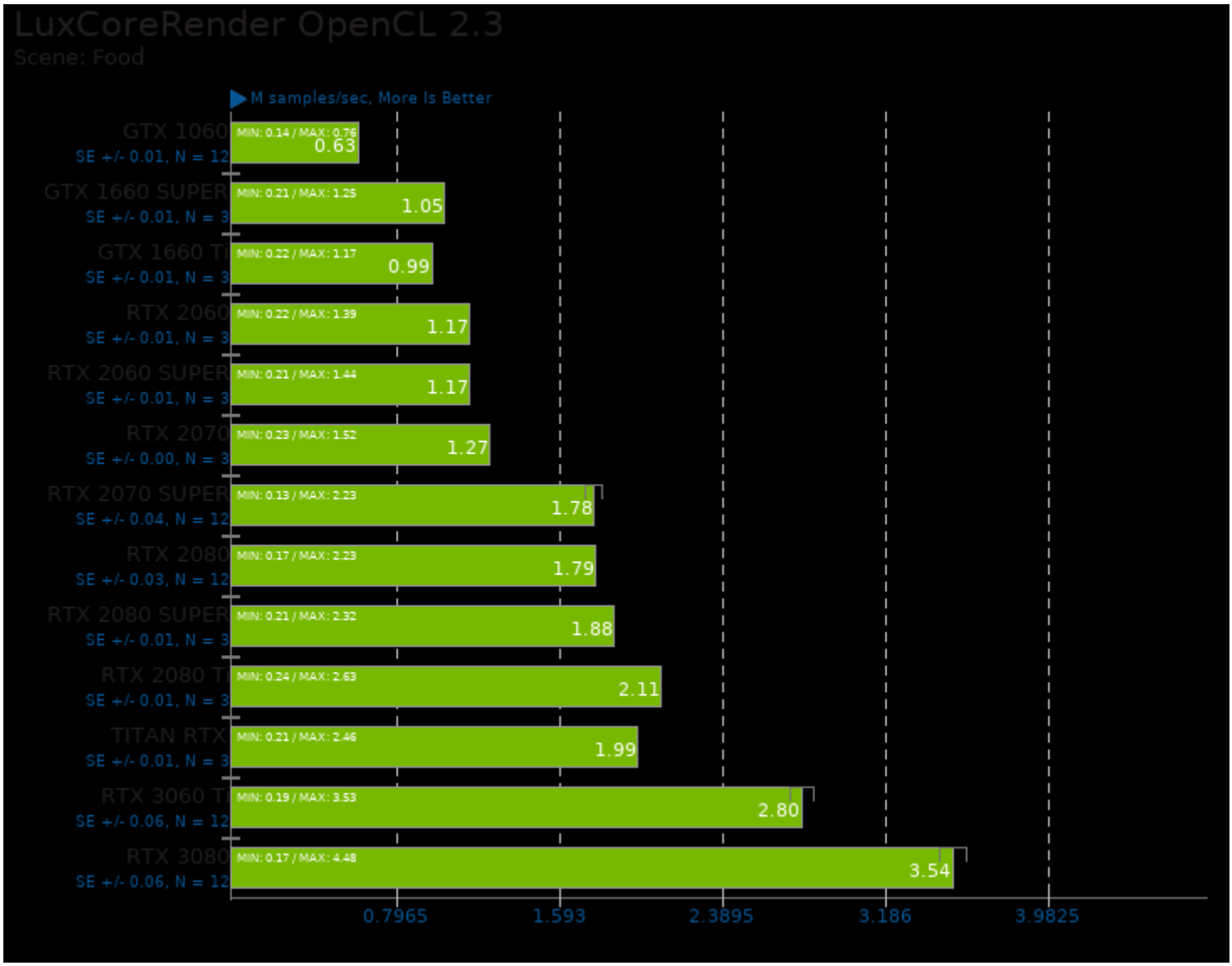
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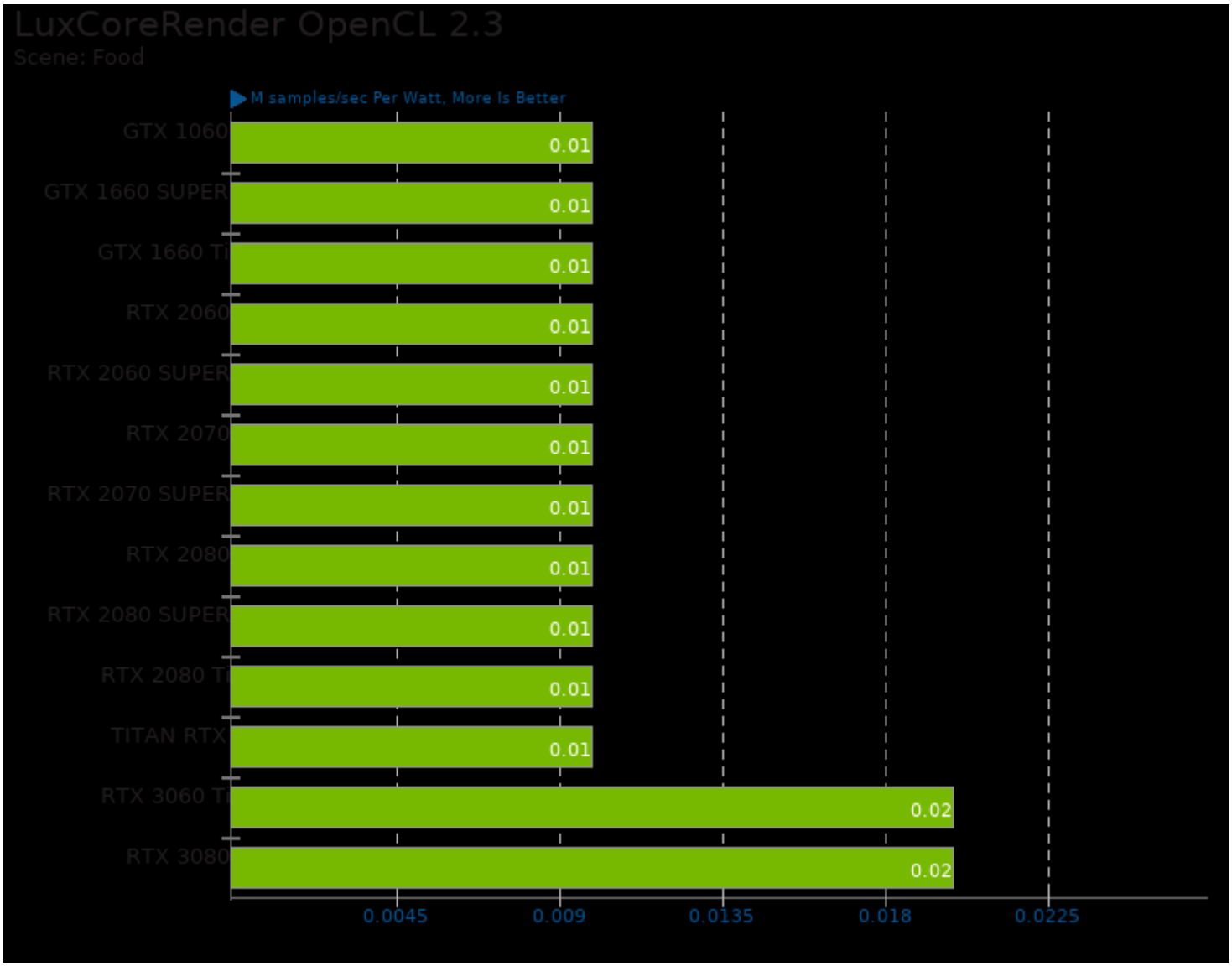
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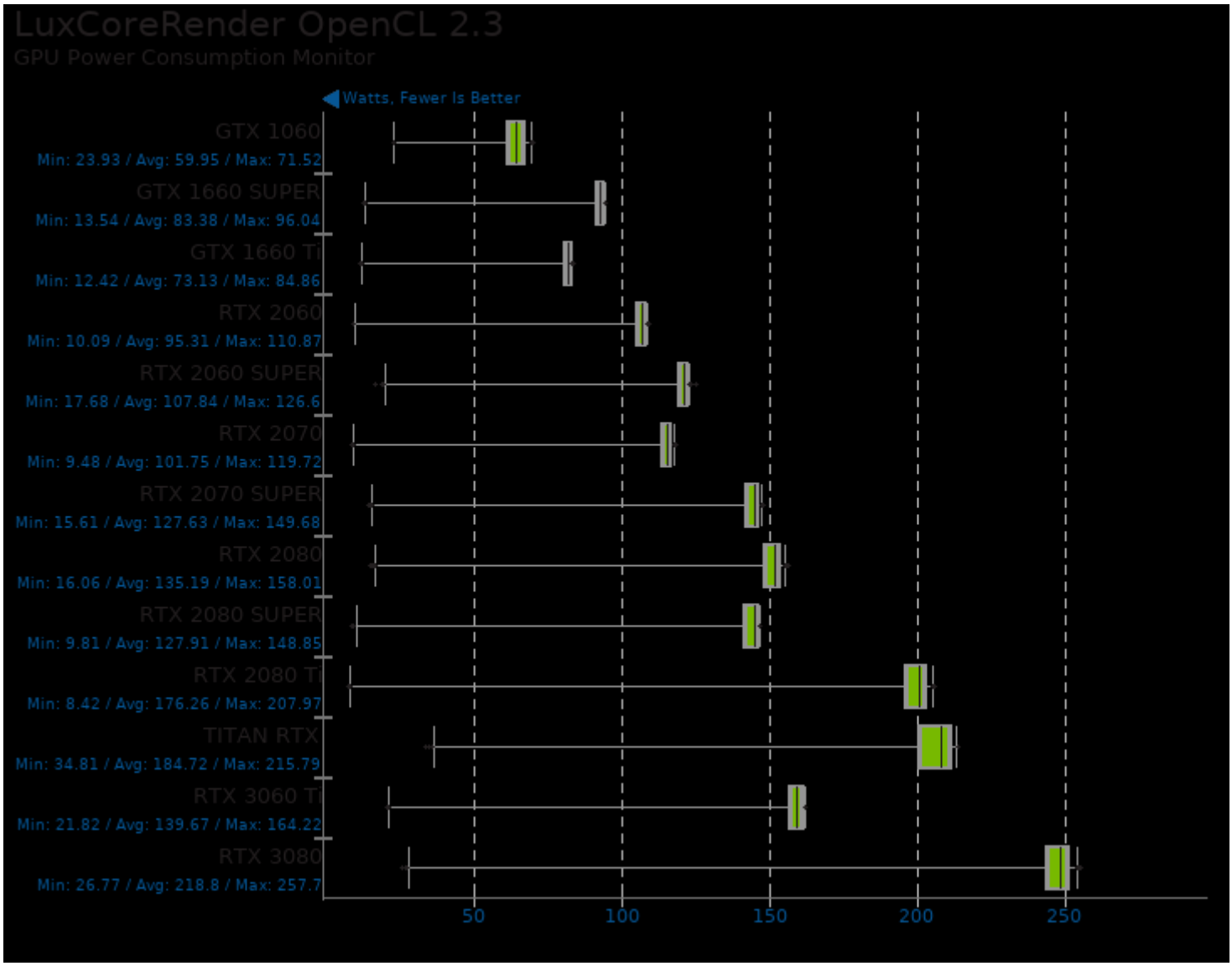
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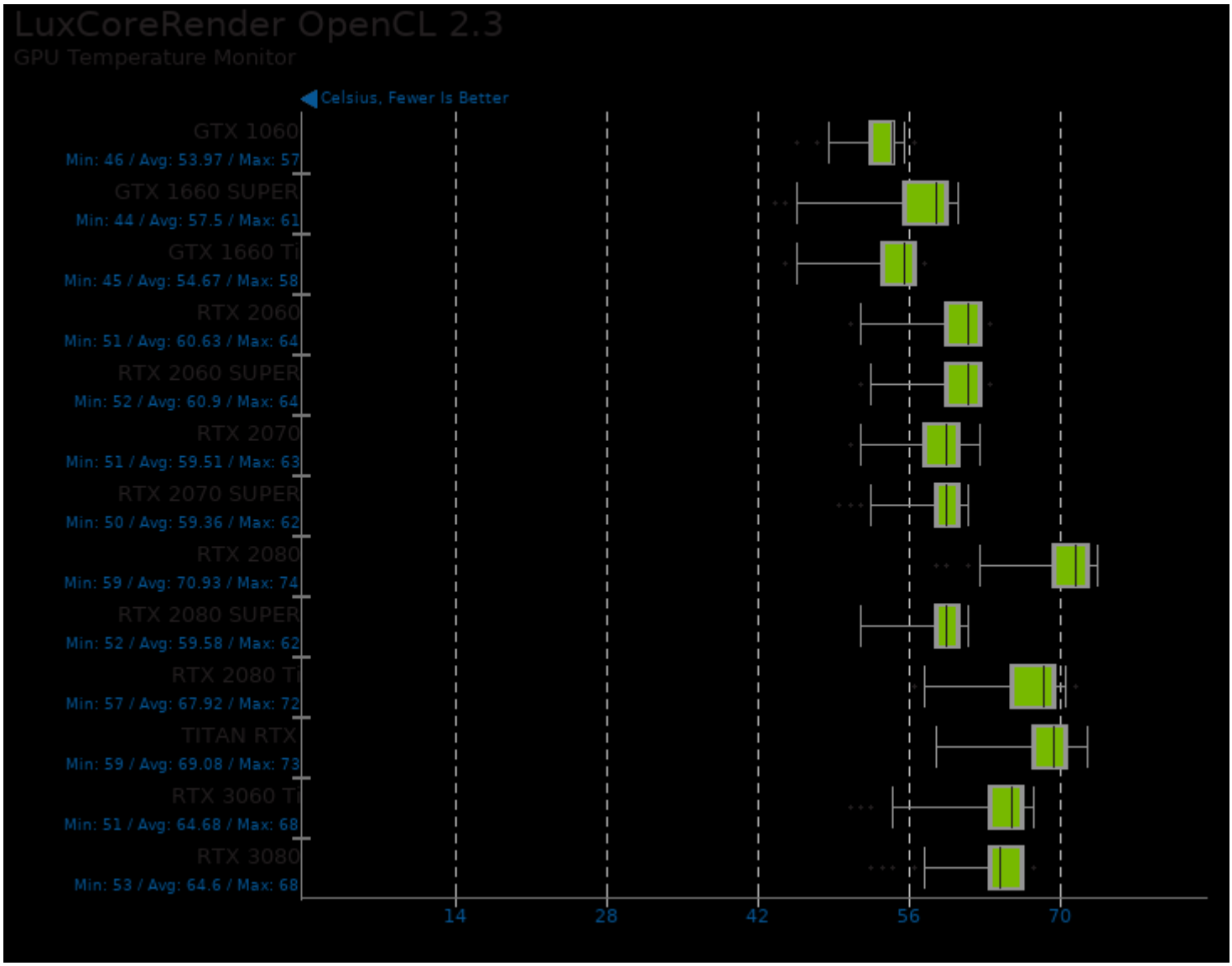
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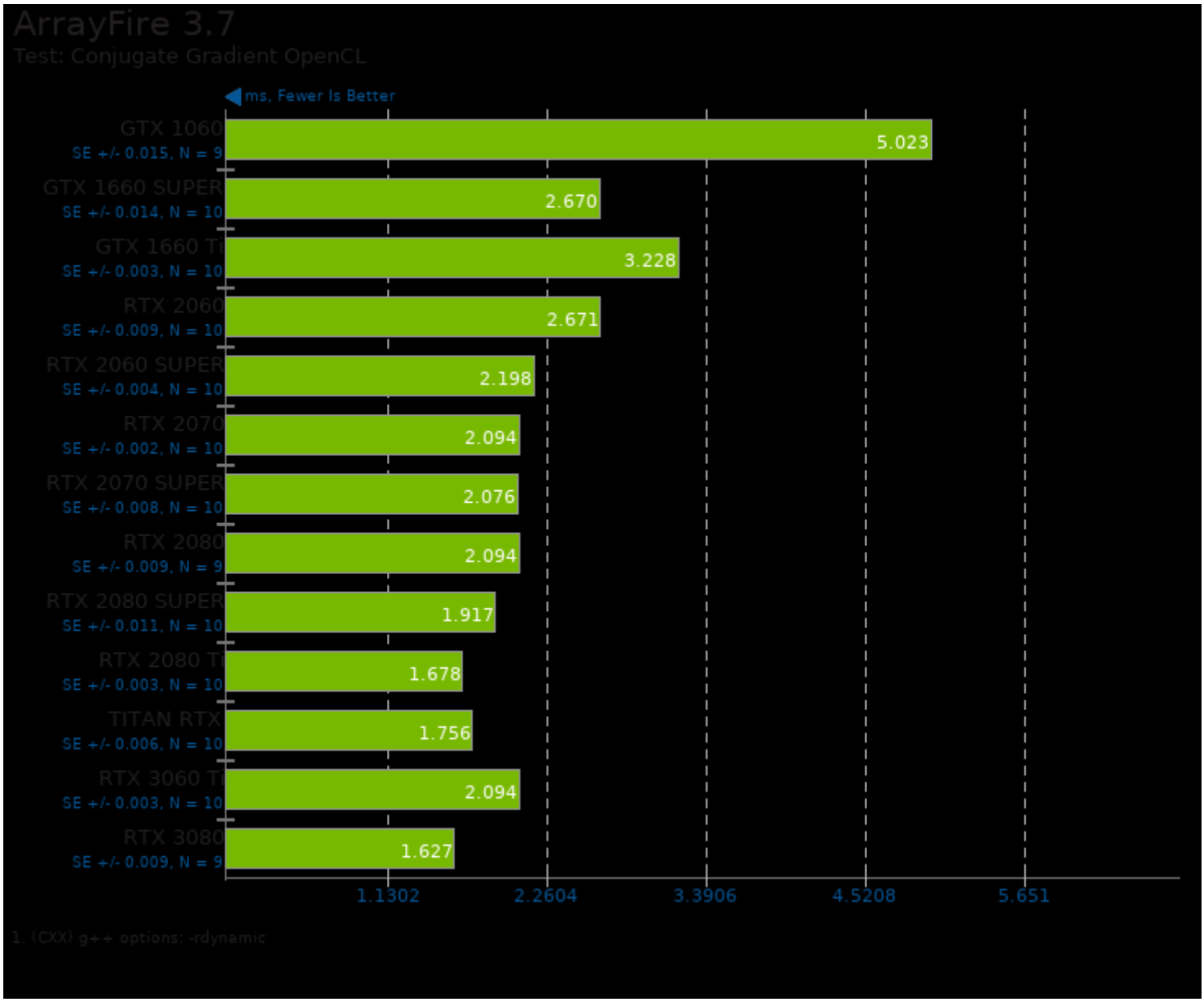
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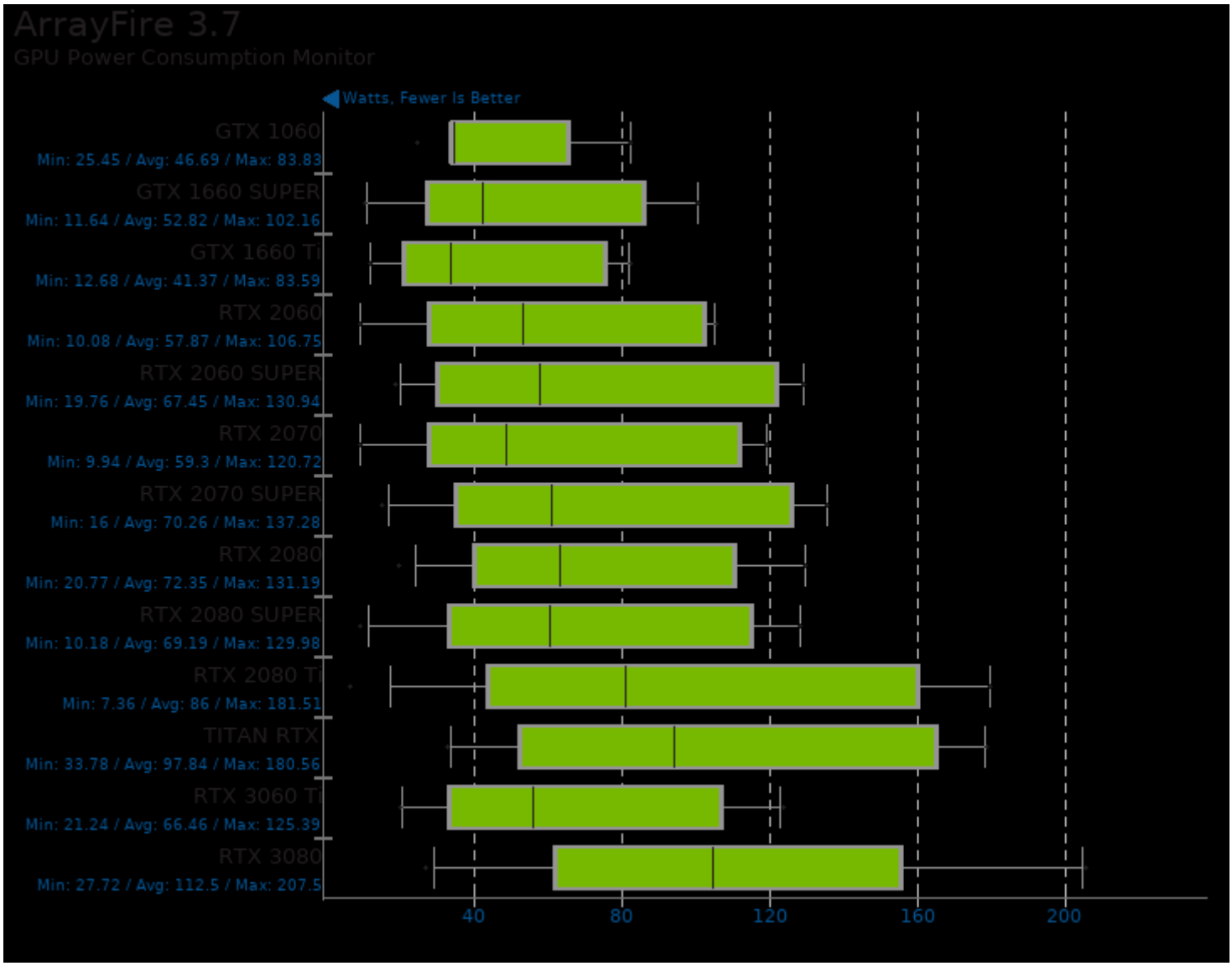
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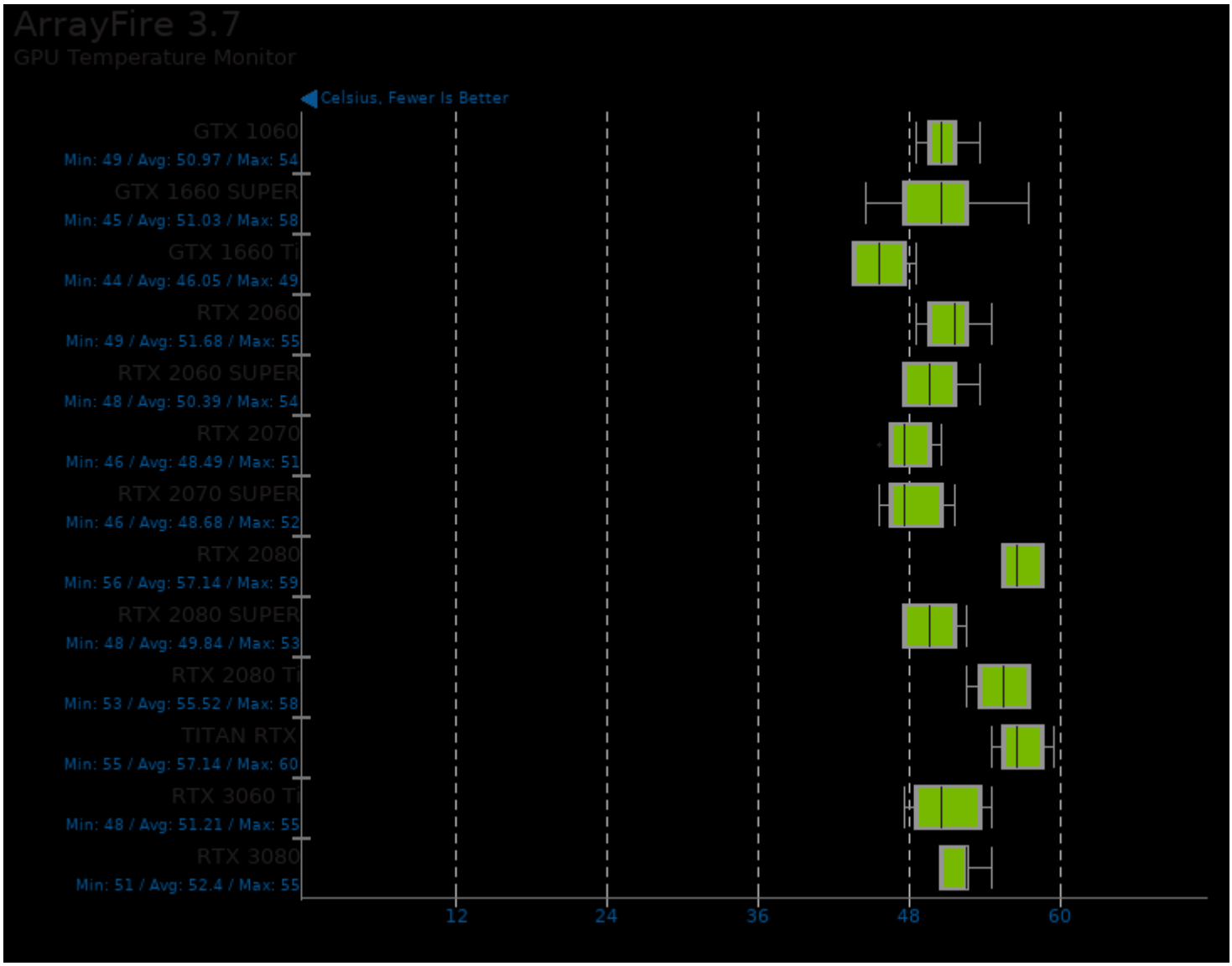
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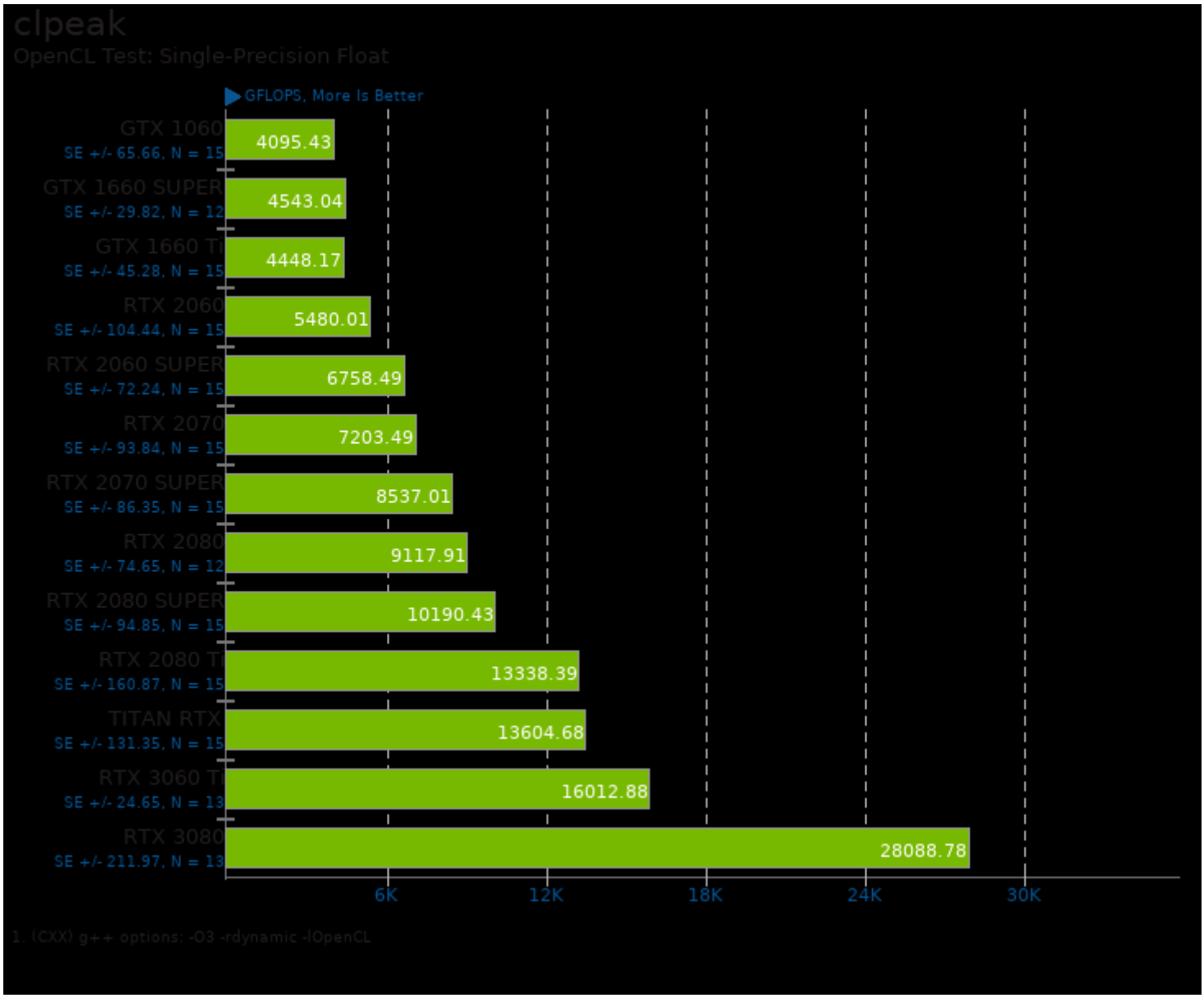
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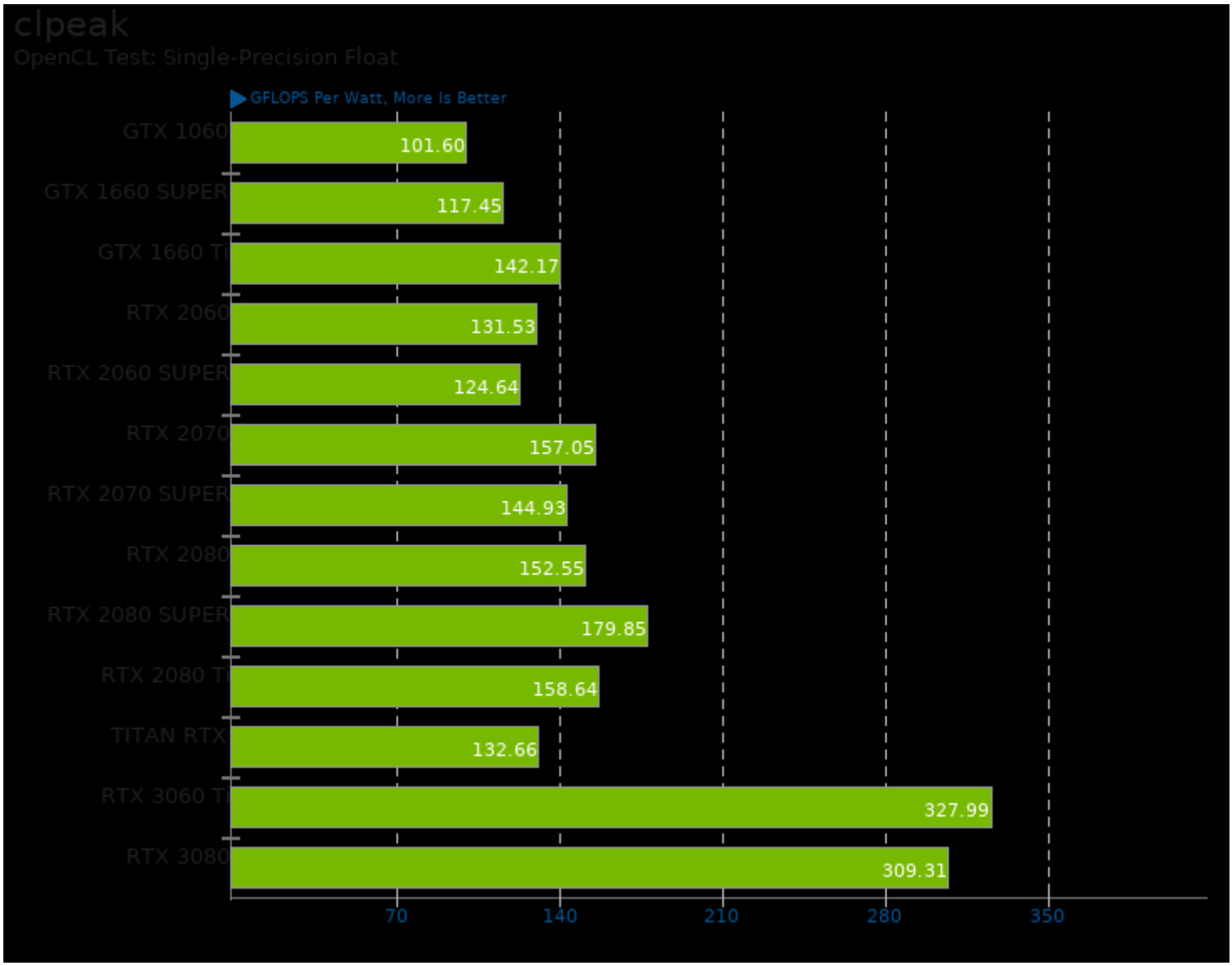
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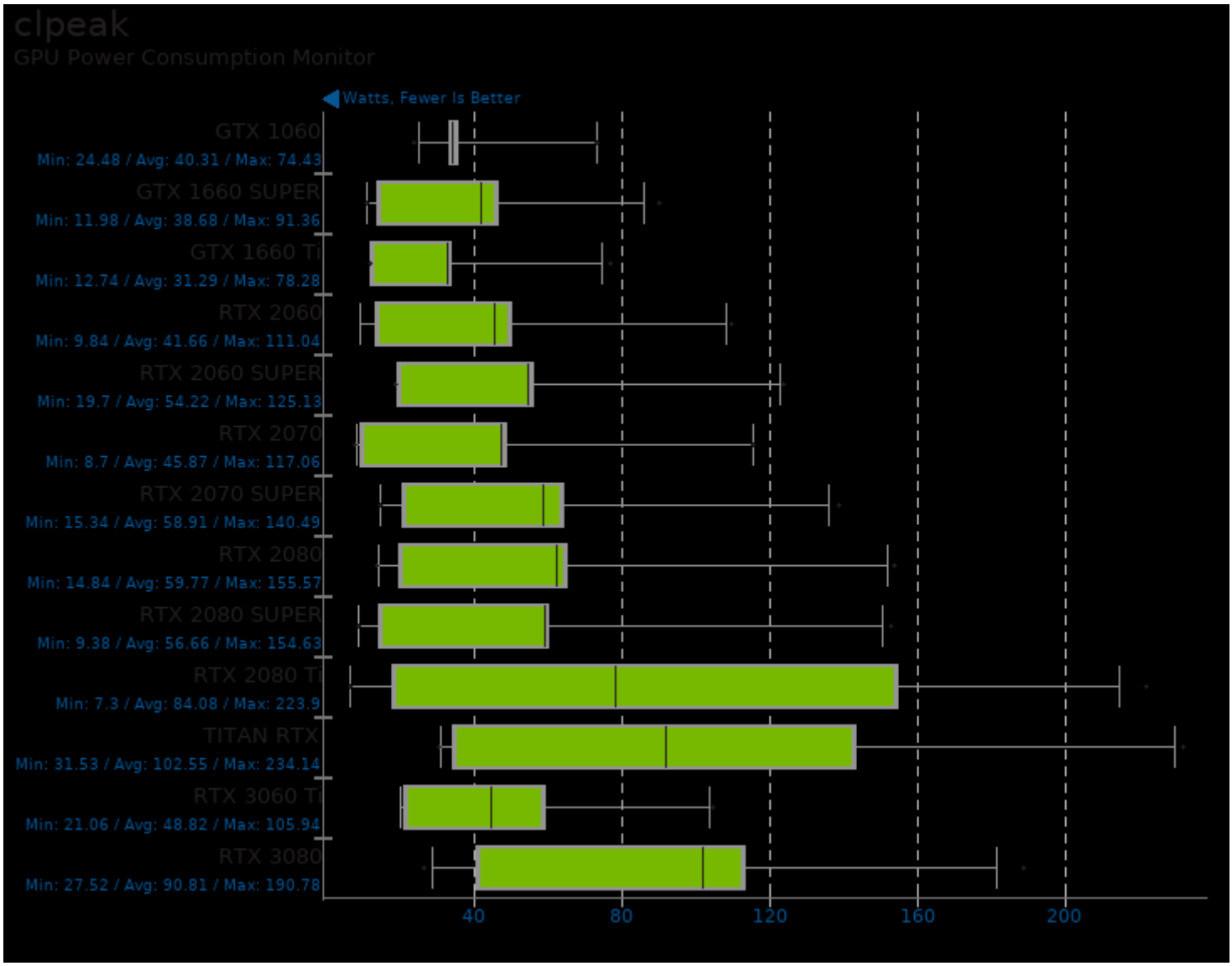
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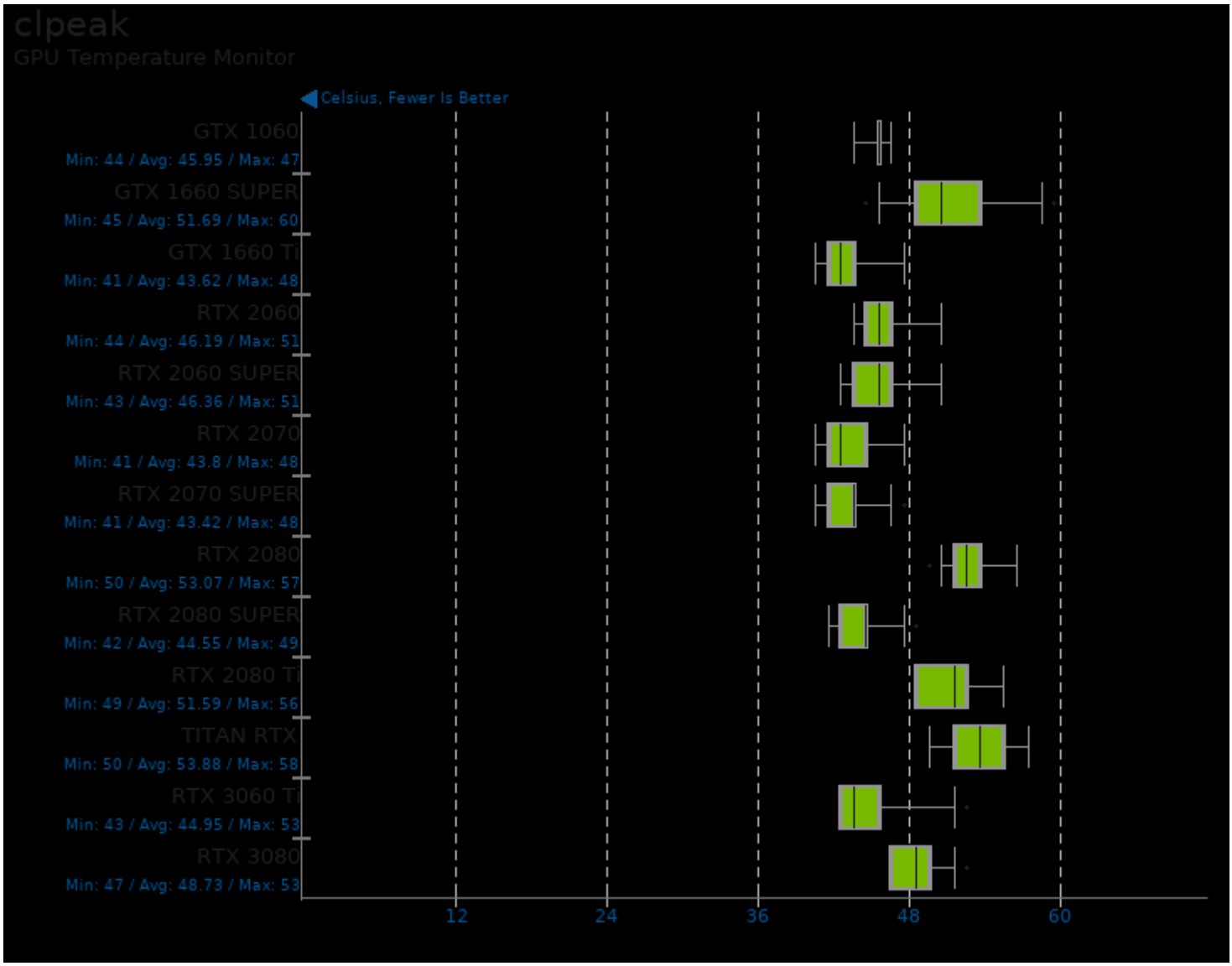
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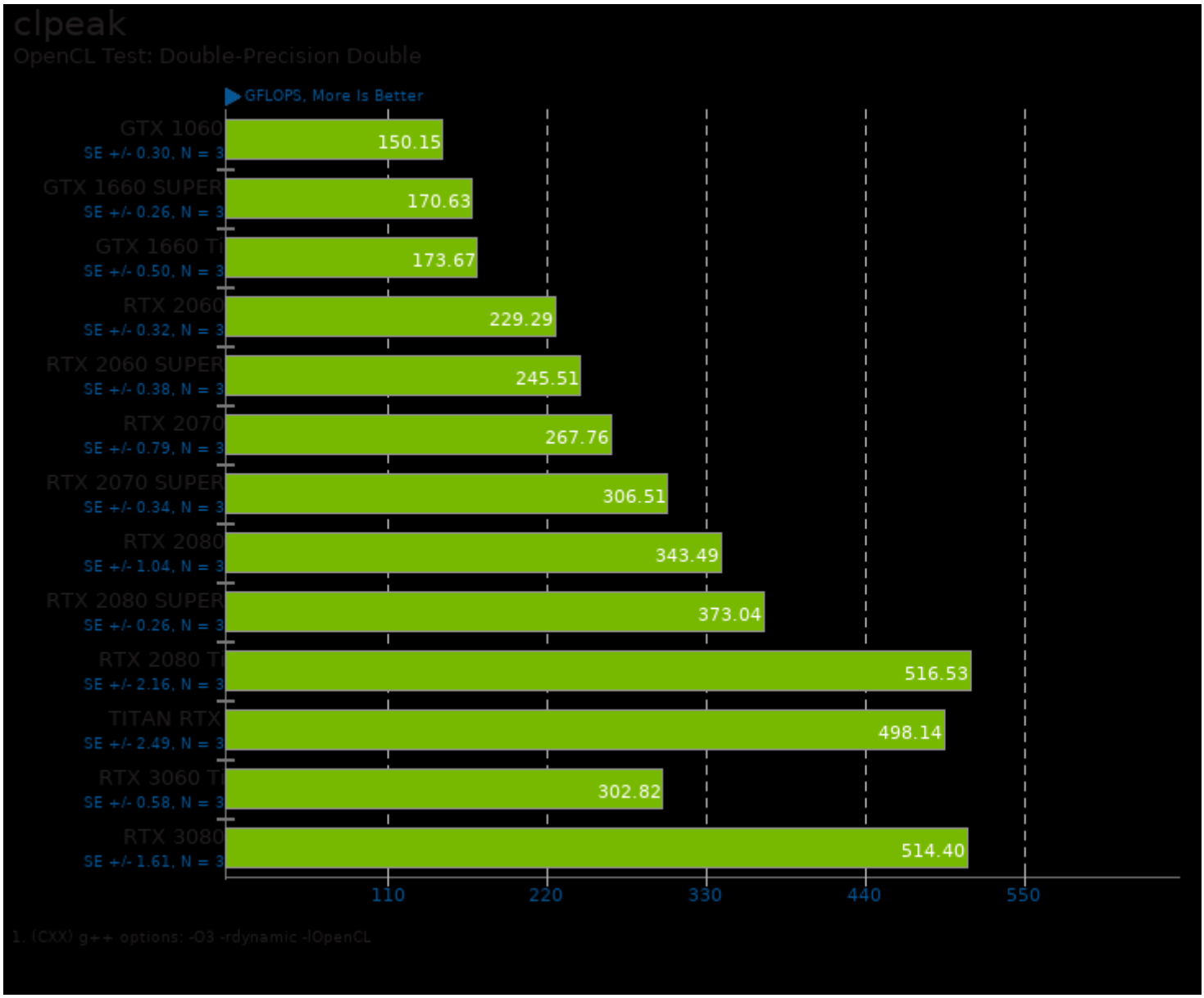
NVIDIA Compute Comparison



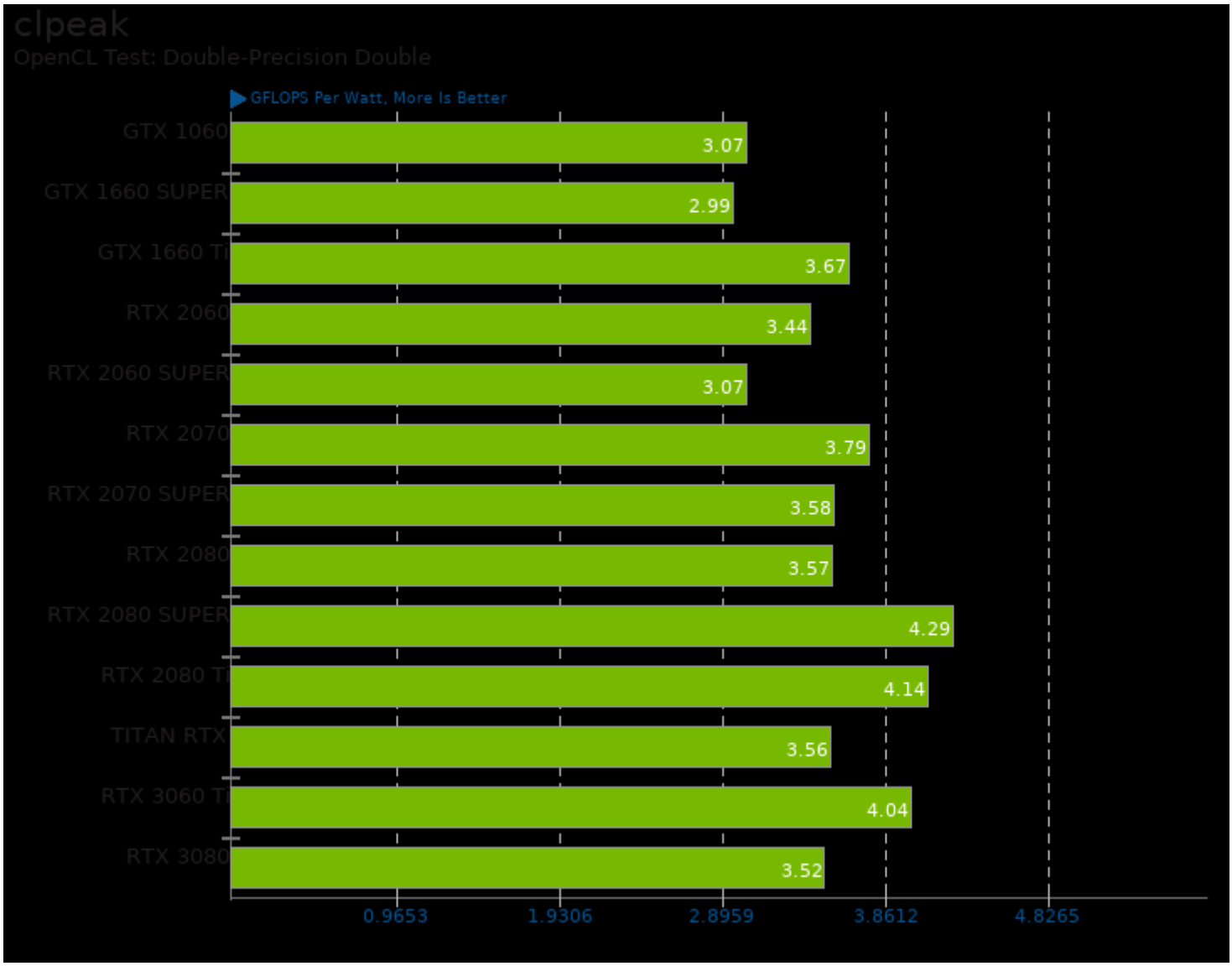
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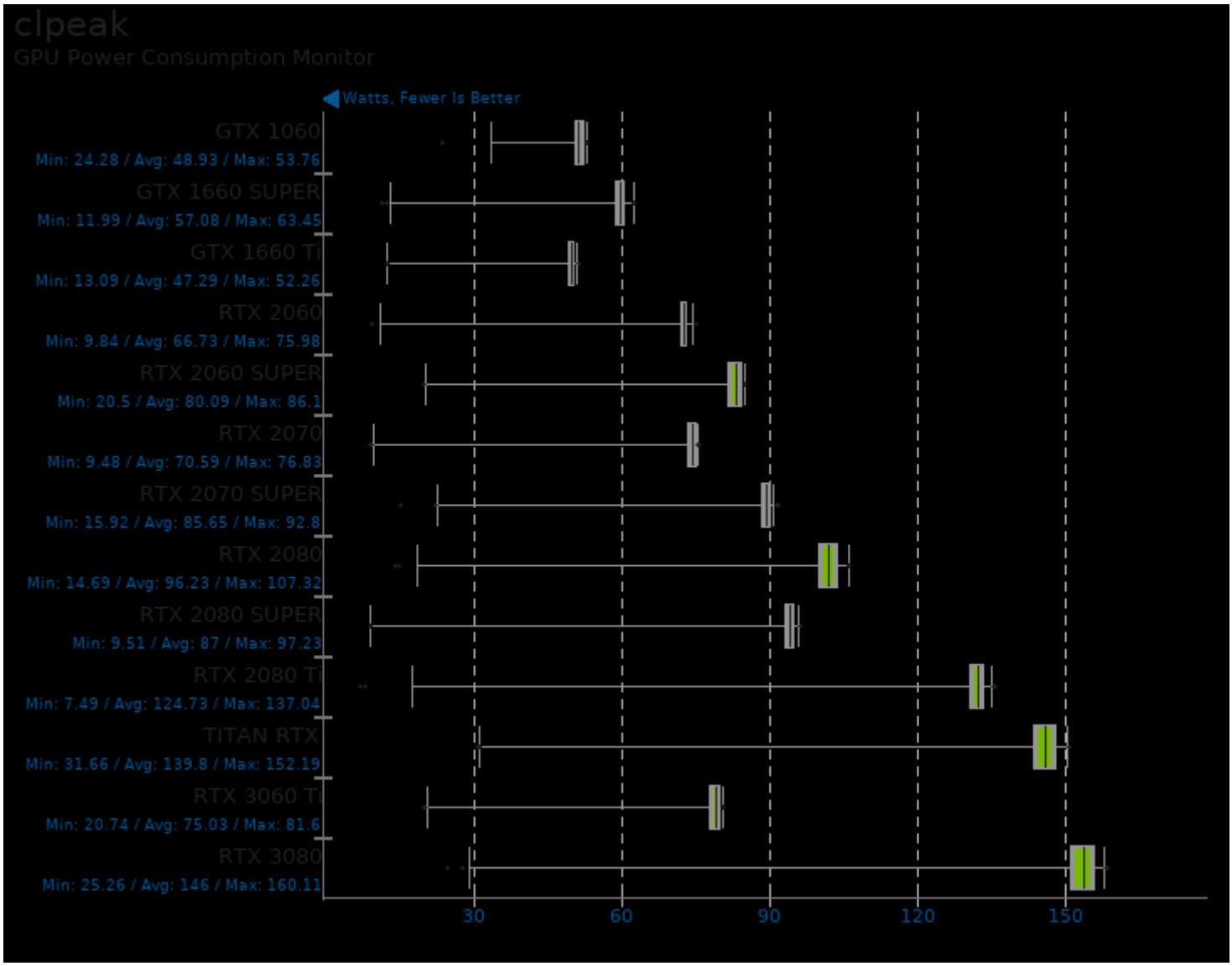
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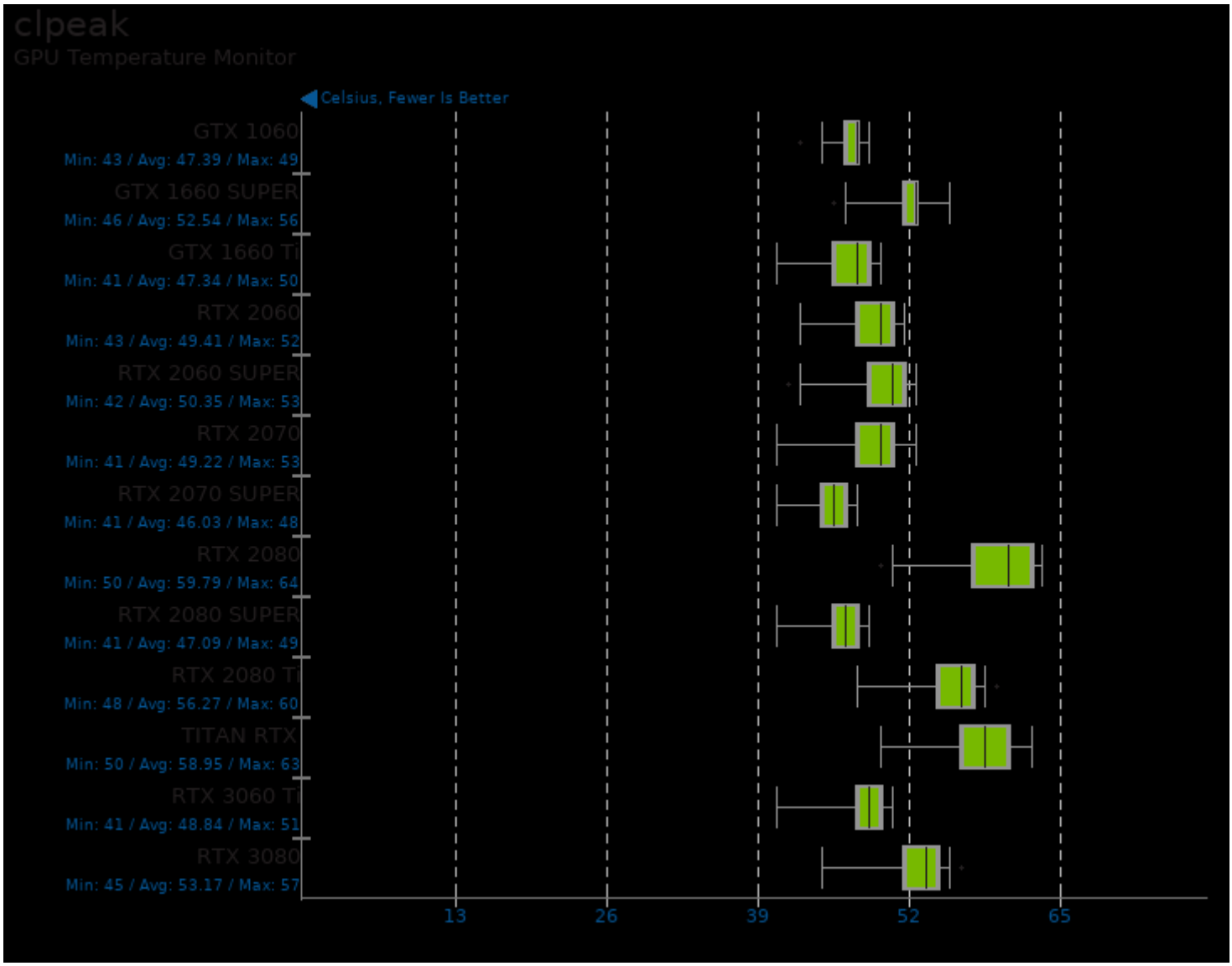
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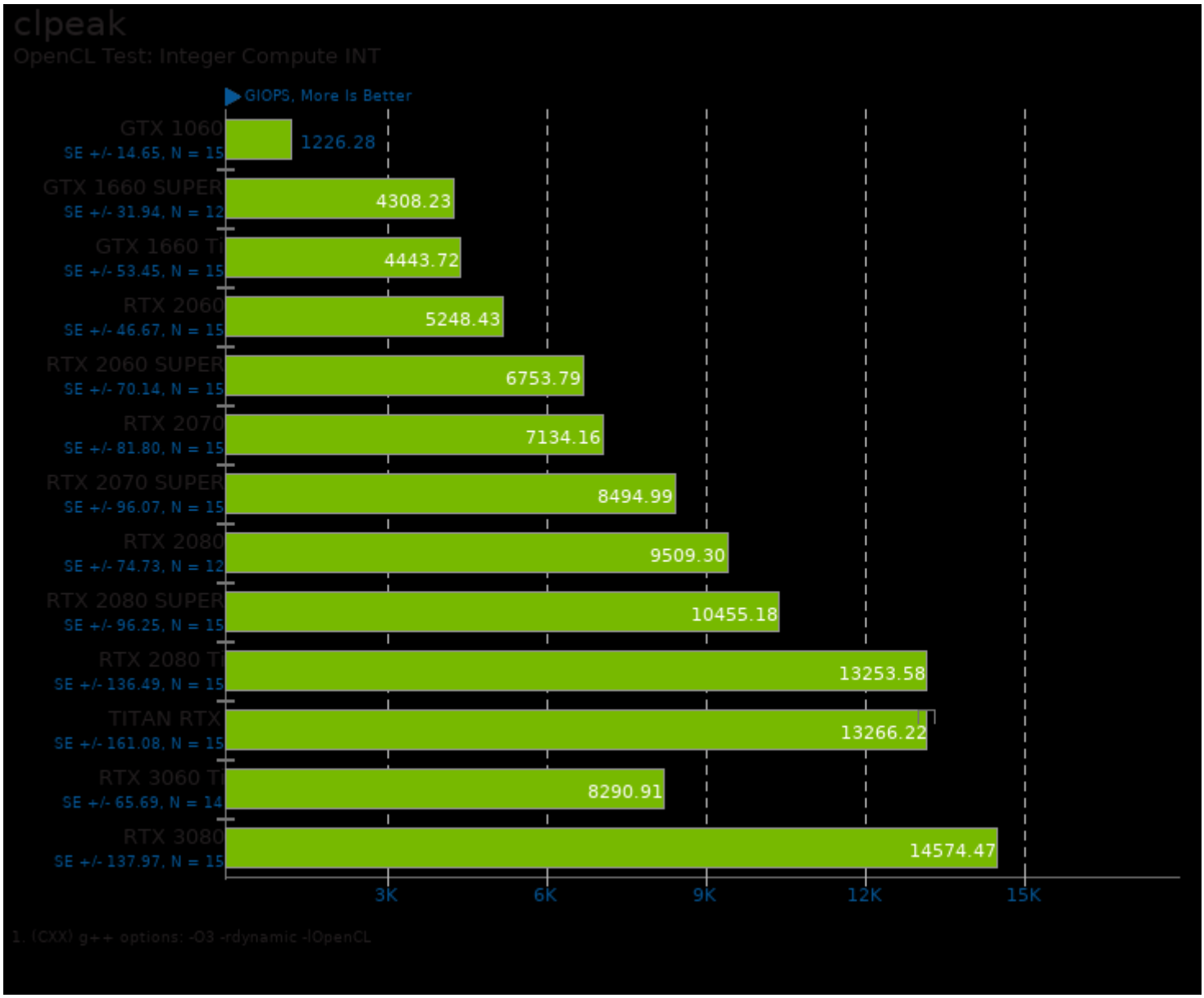
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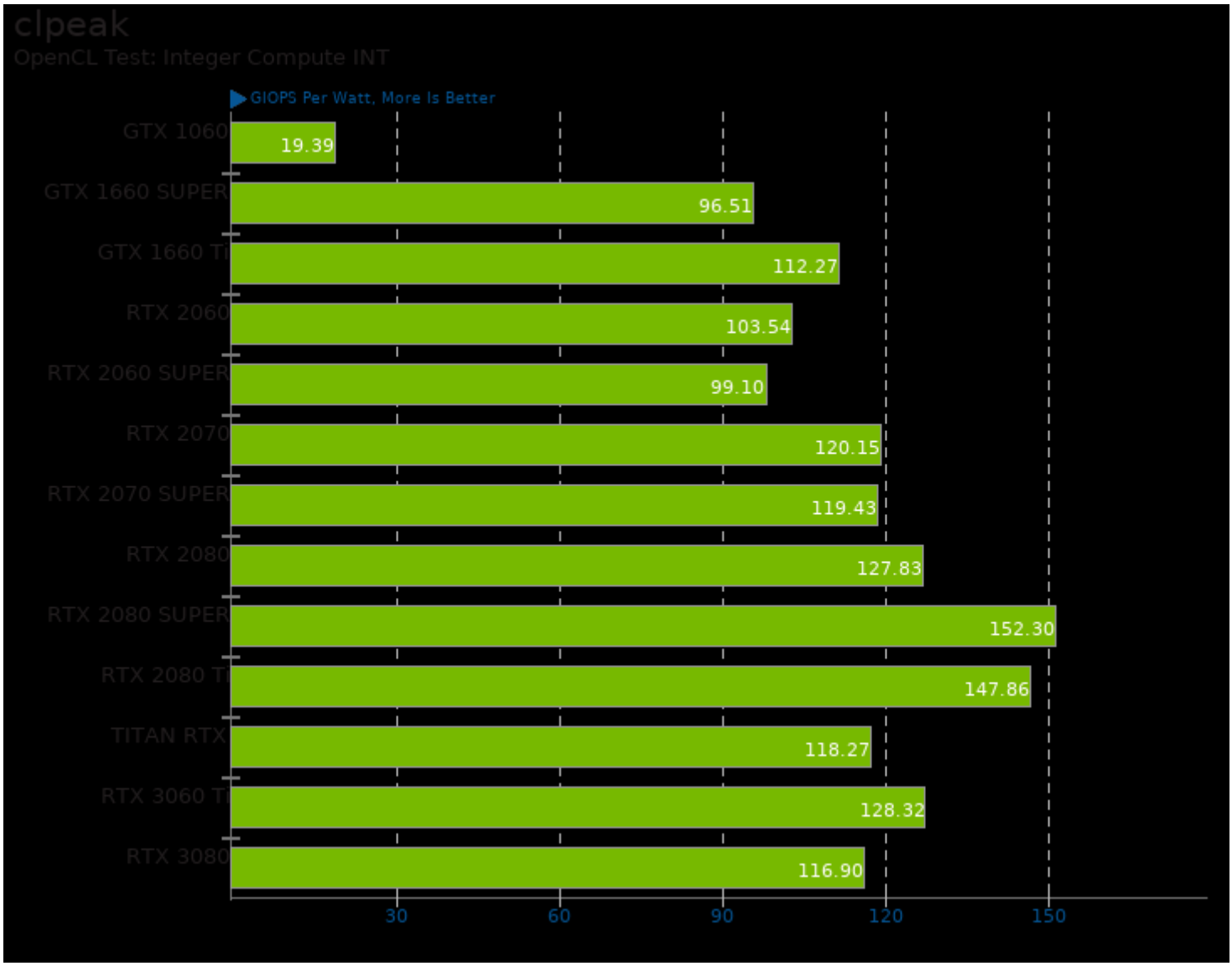
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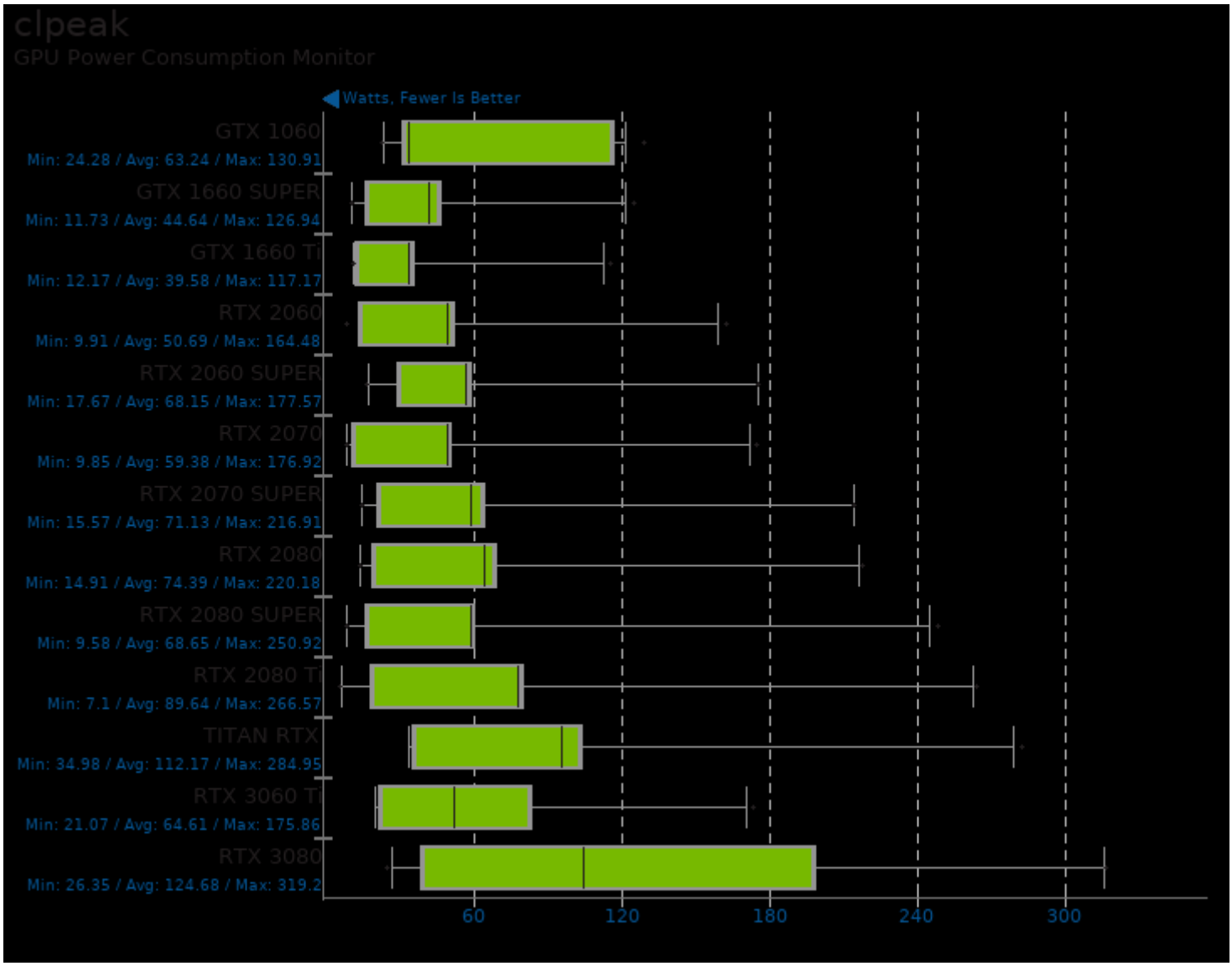
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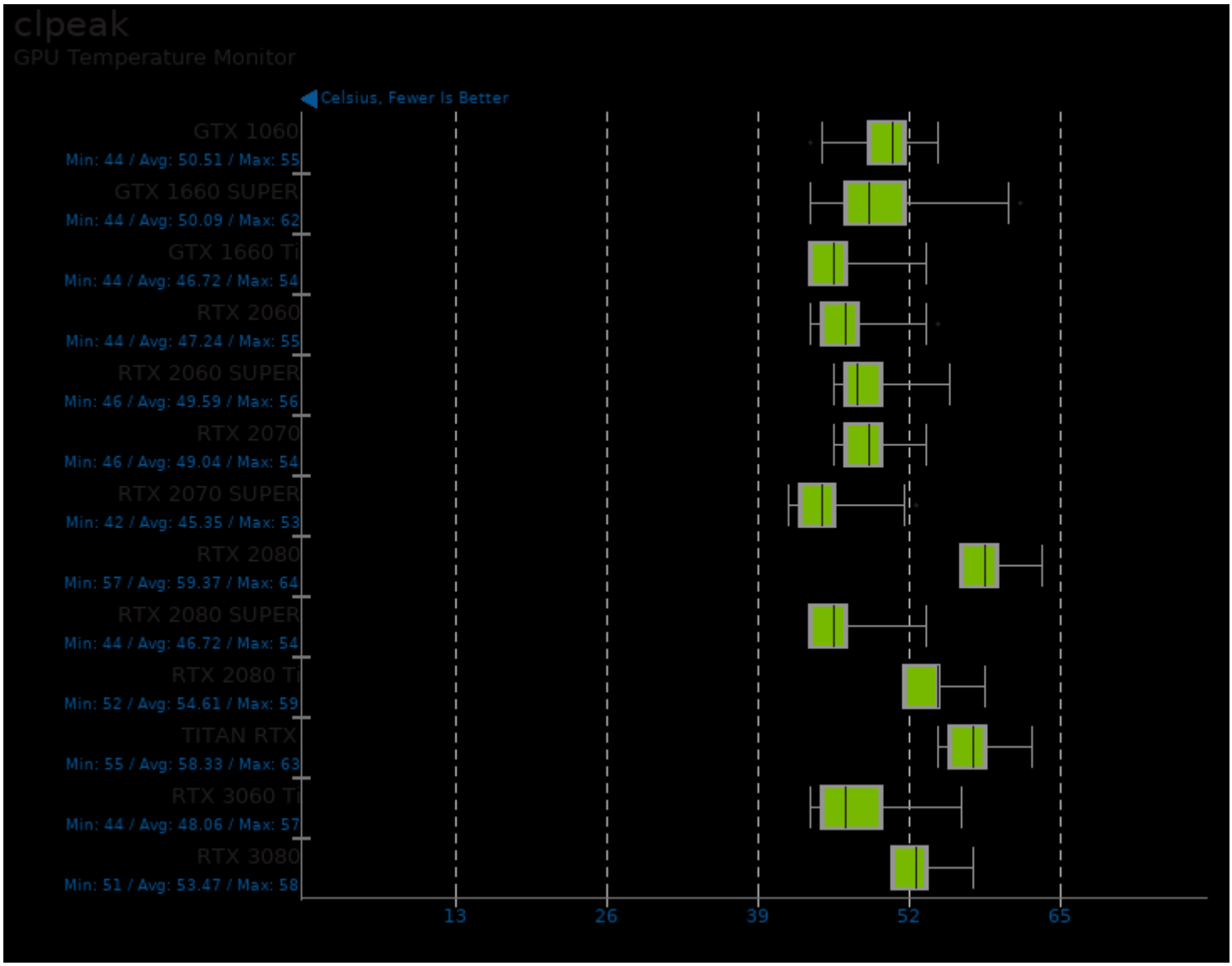
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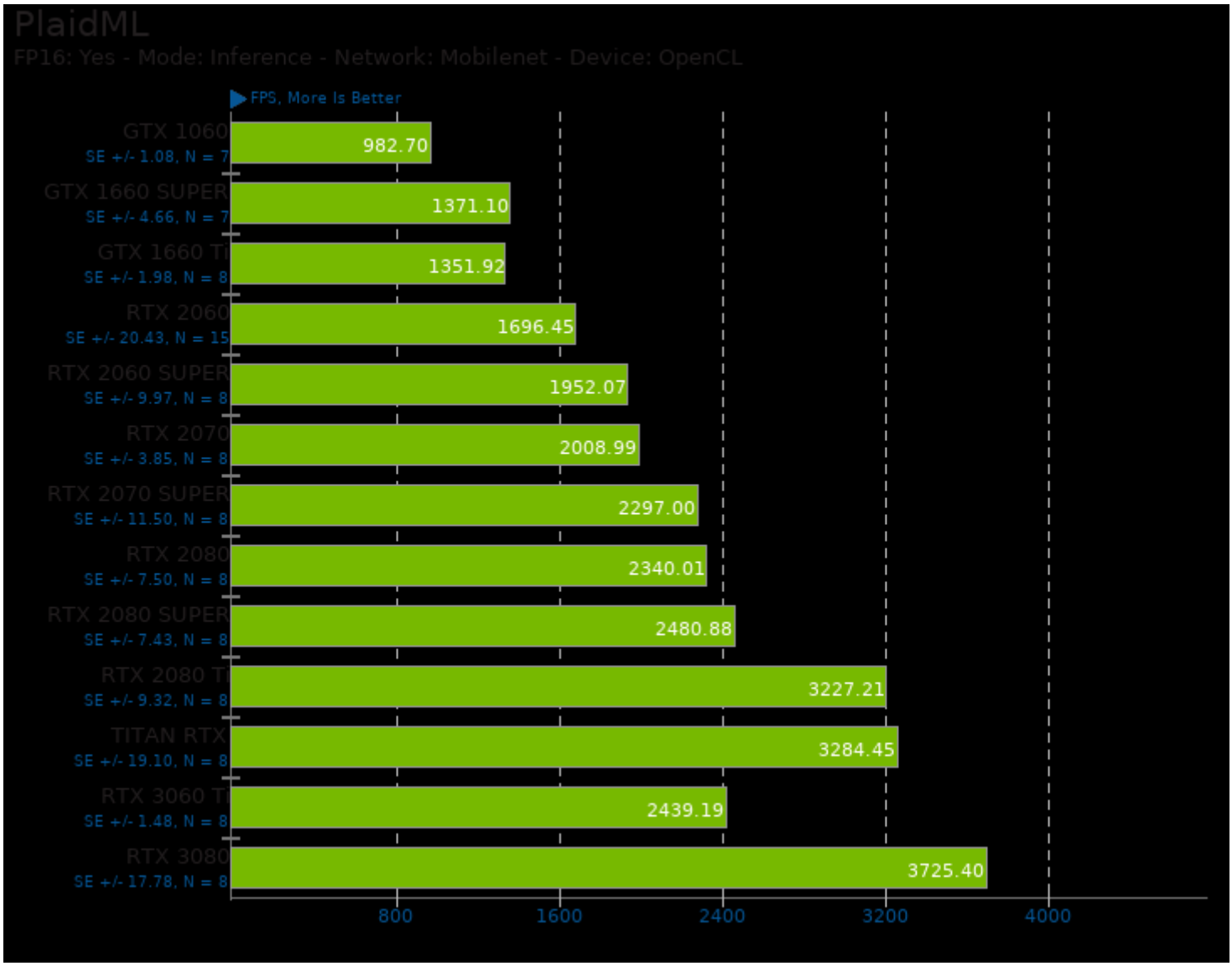
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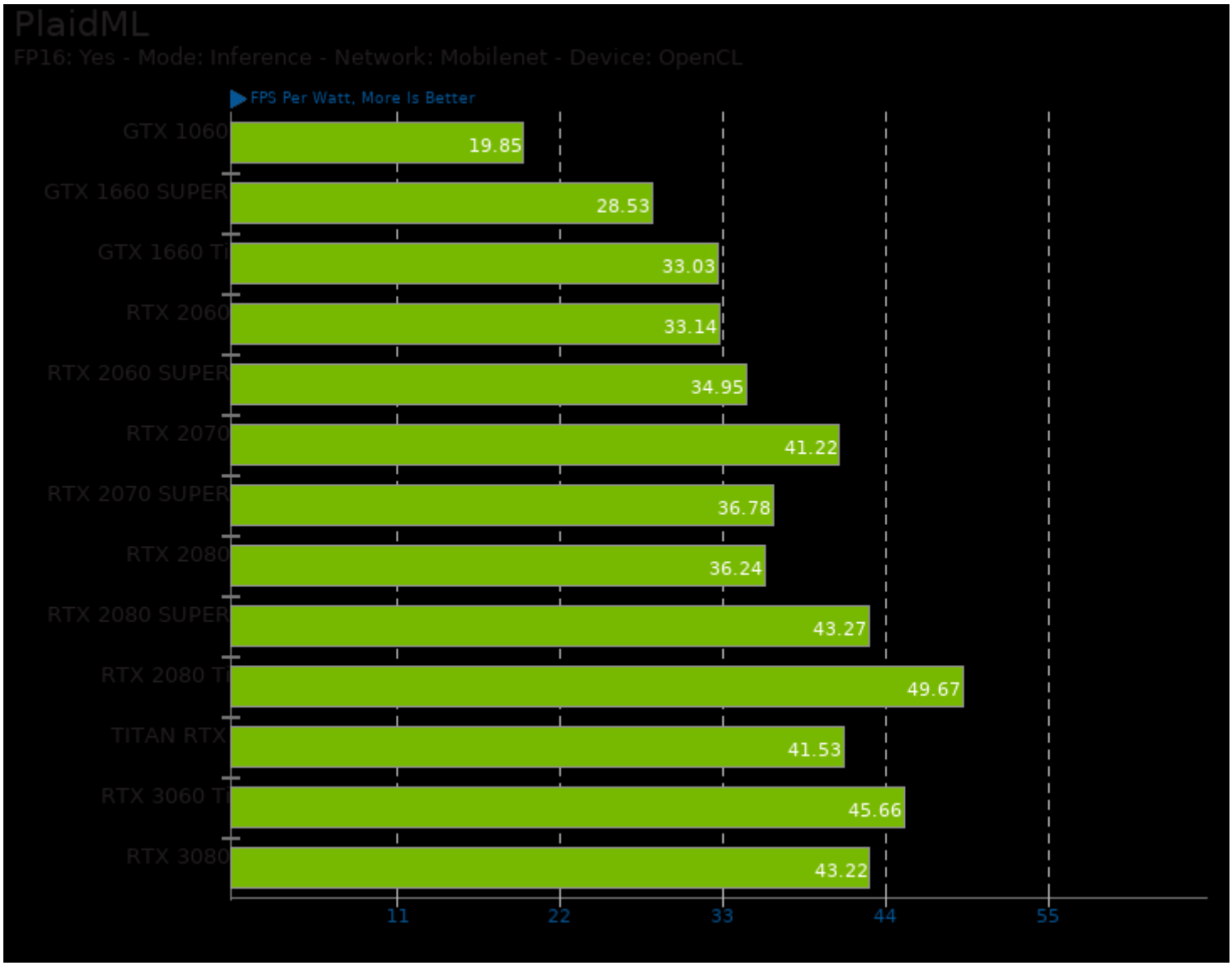
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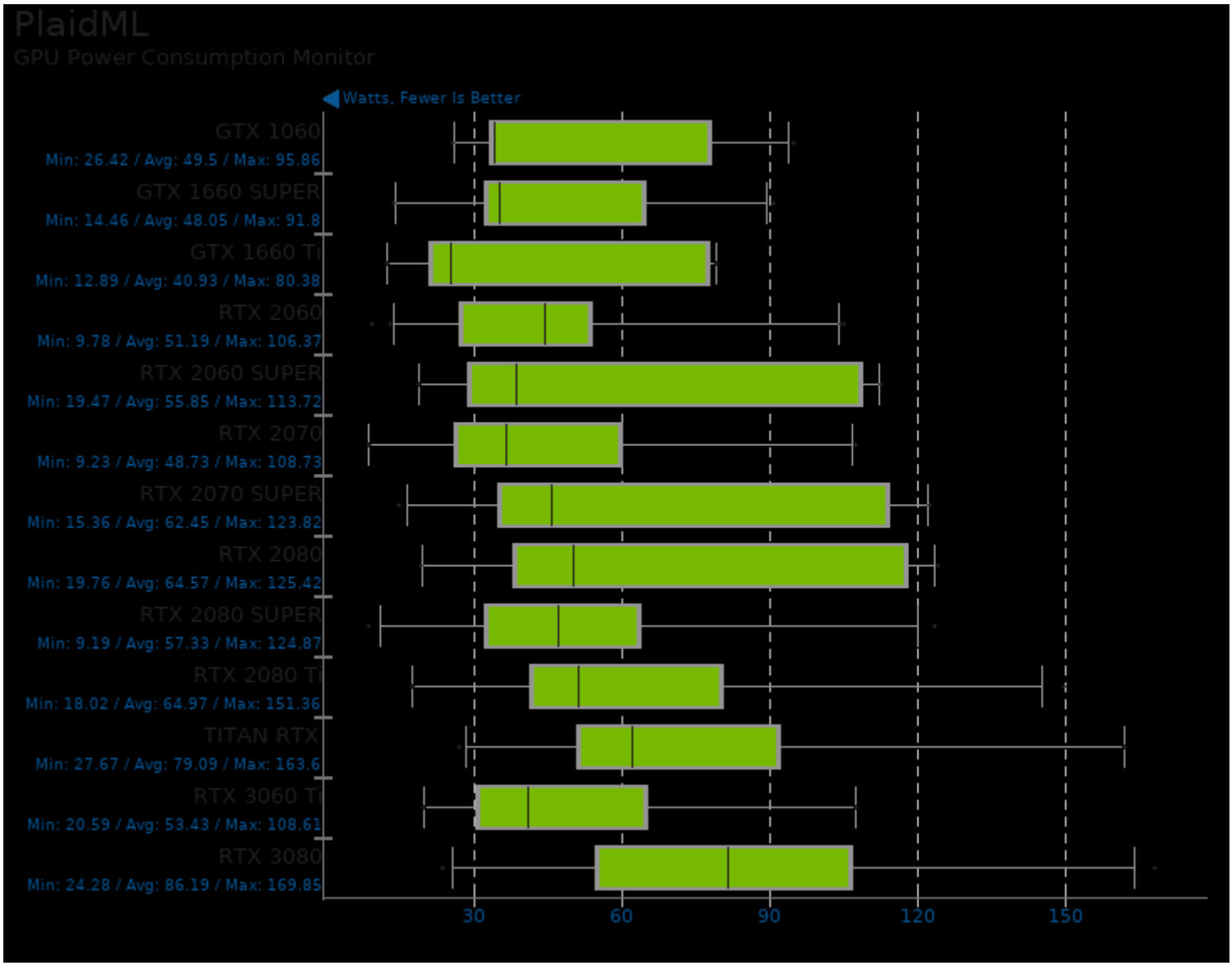
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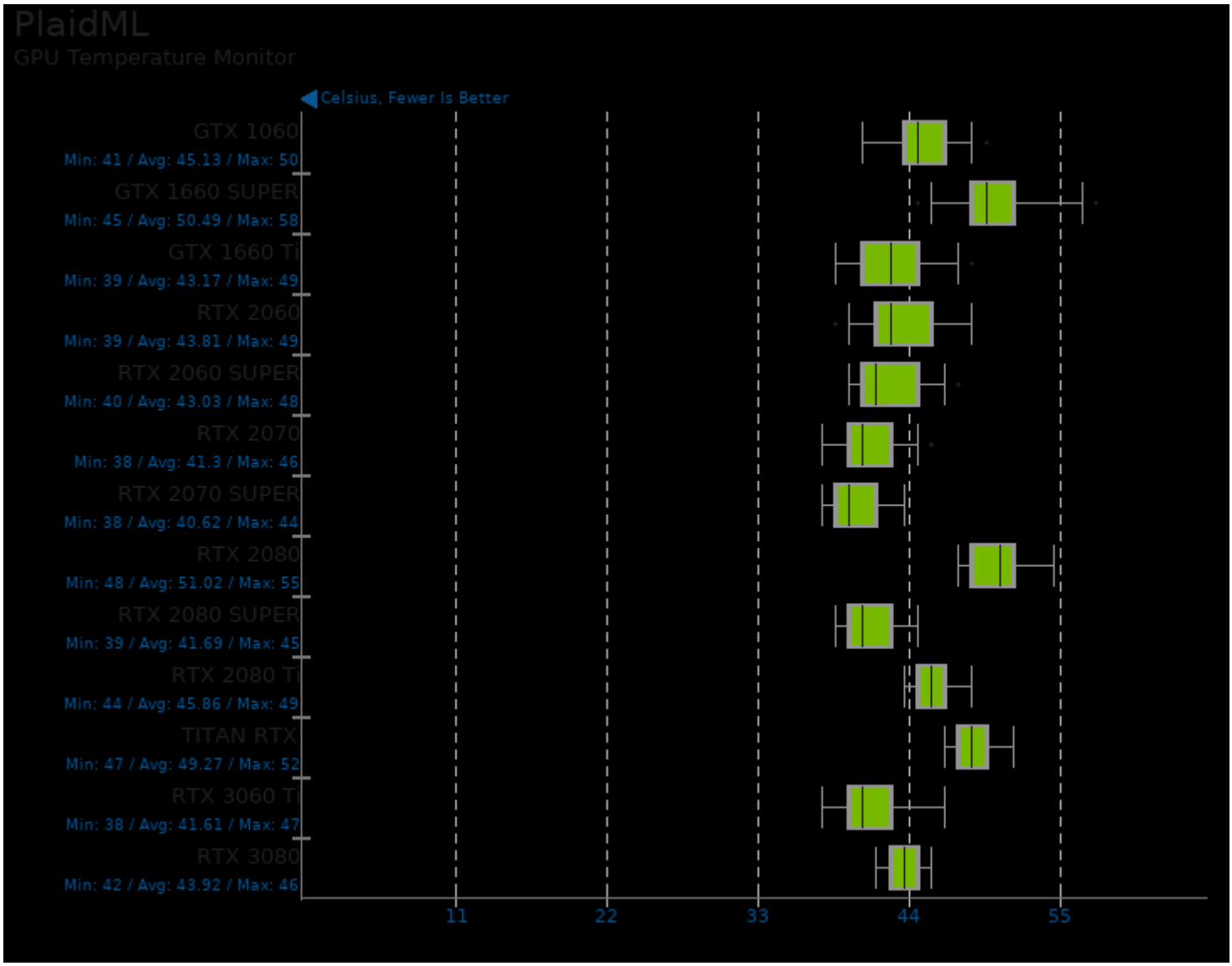
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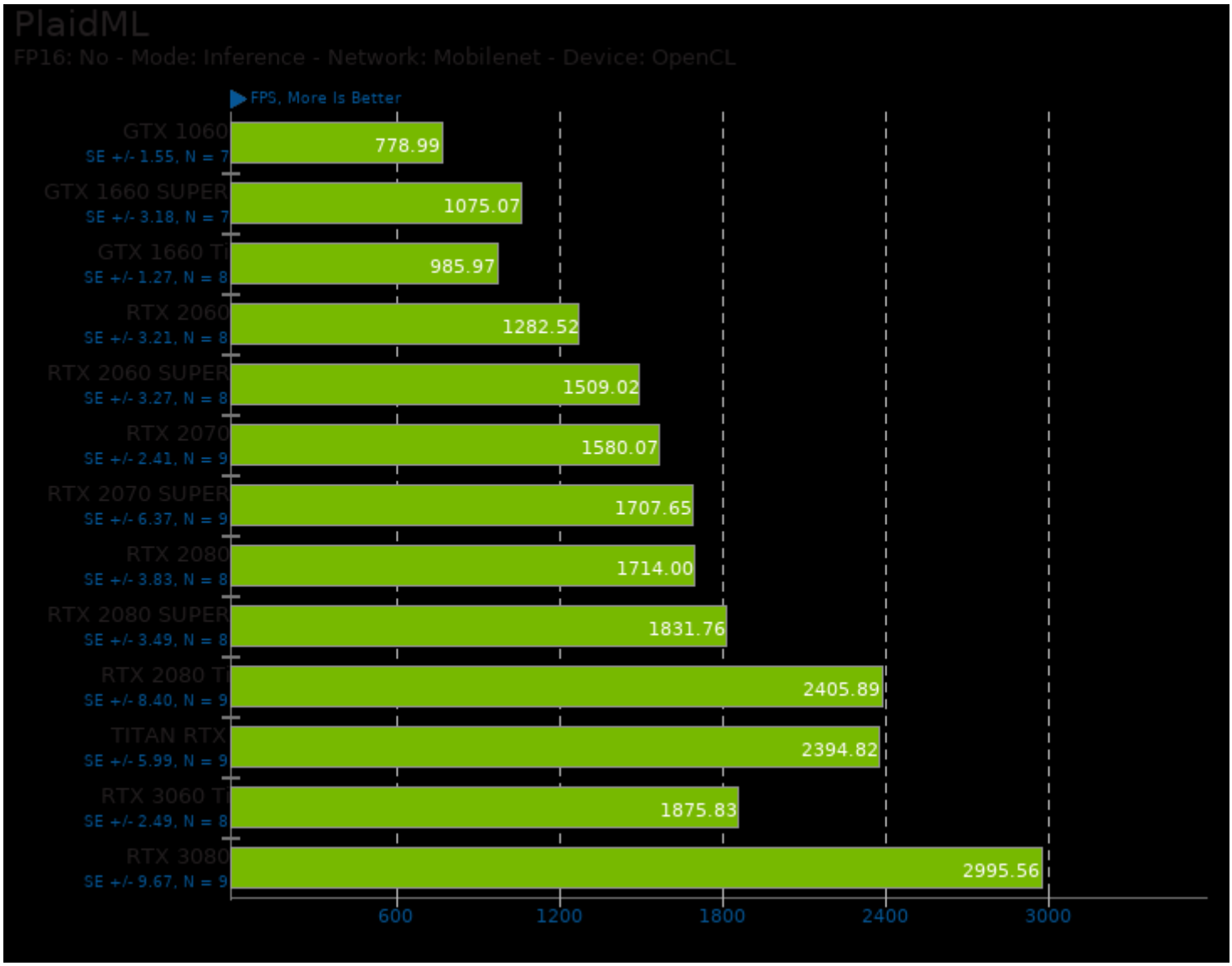
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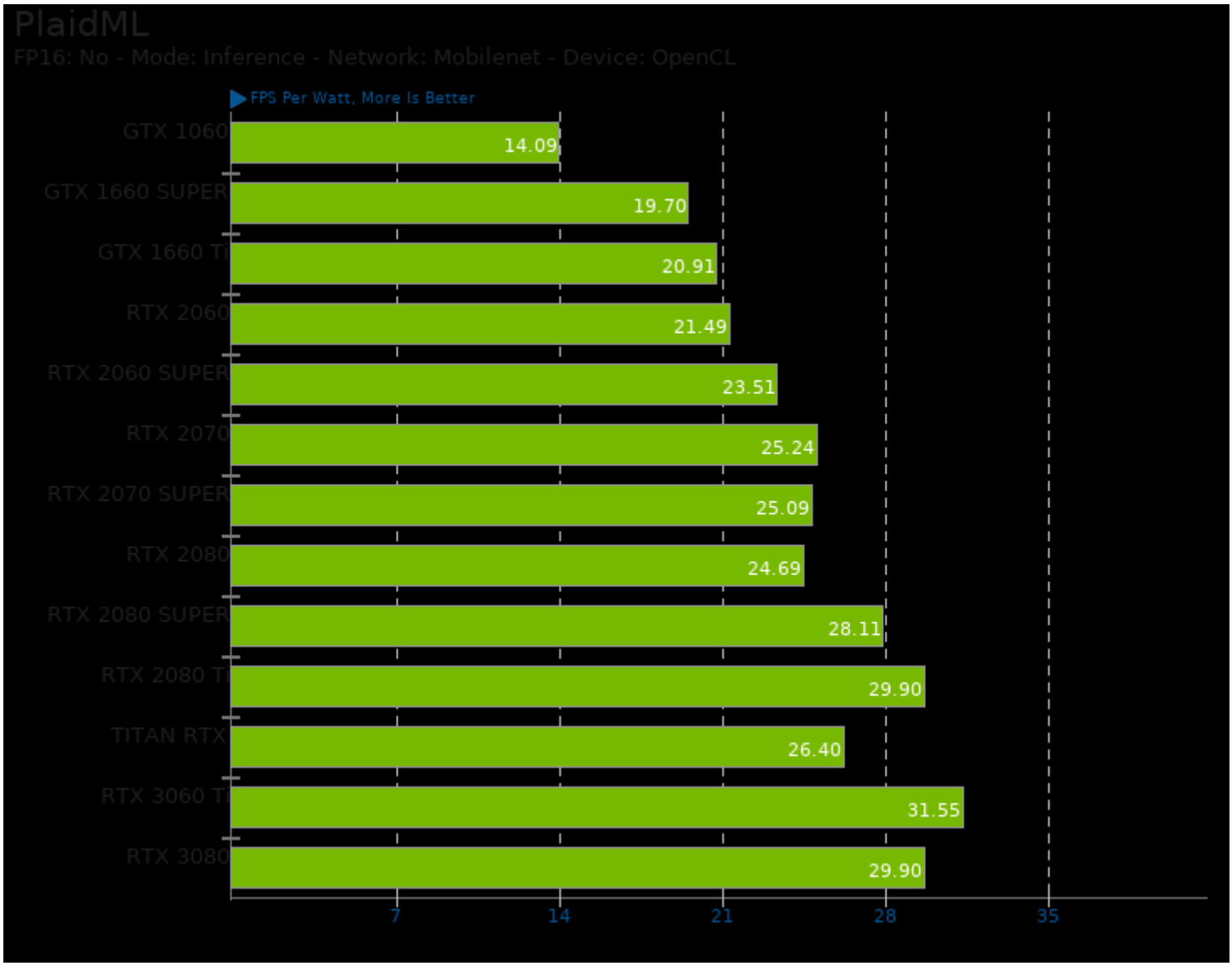
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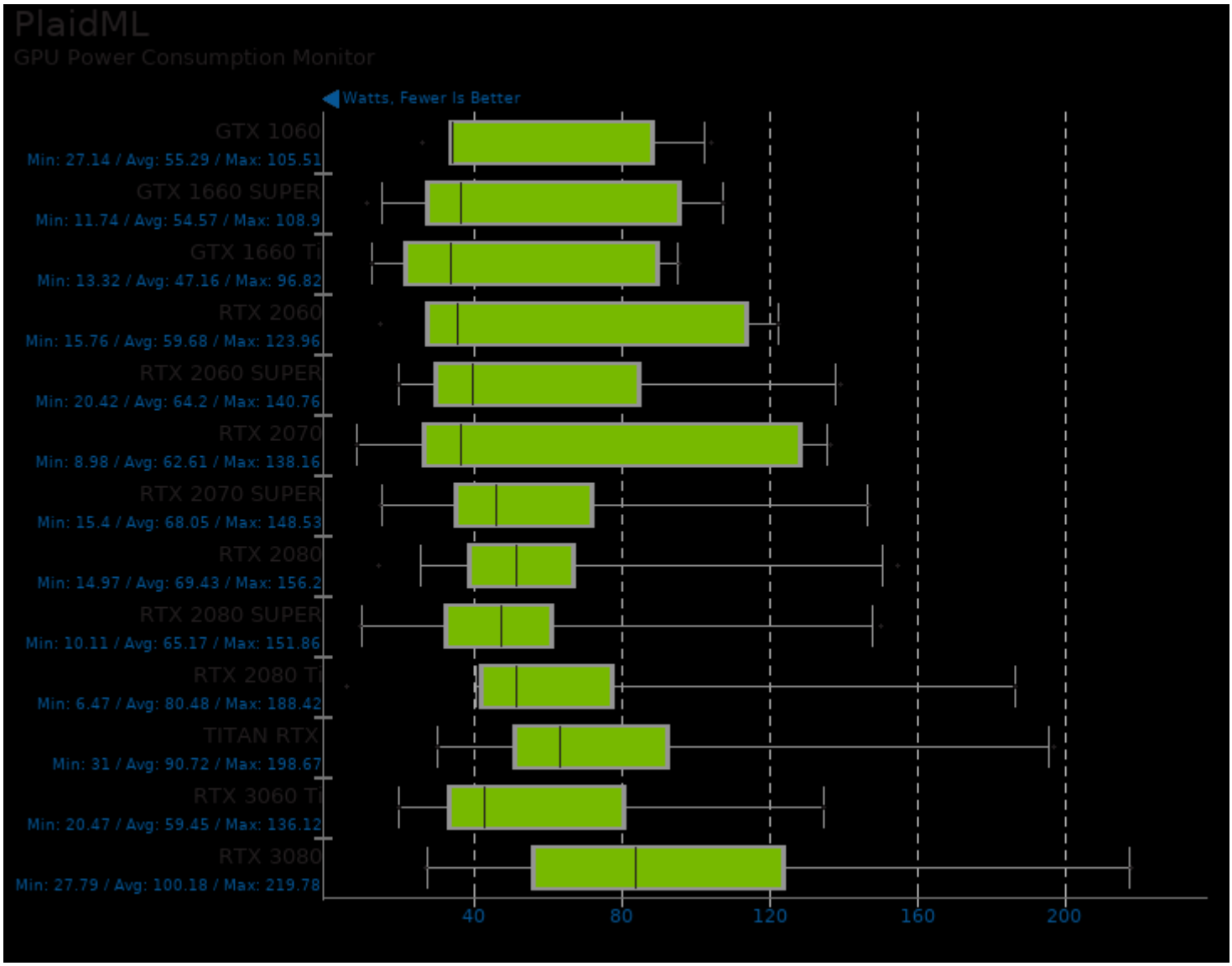
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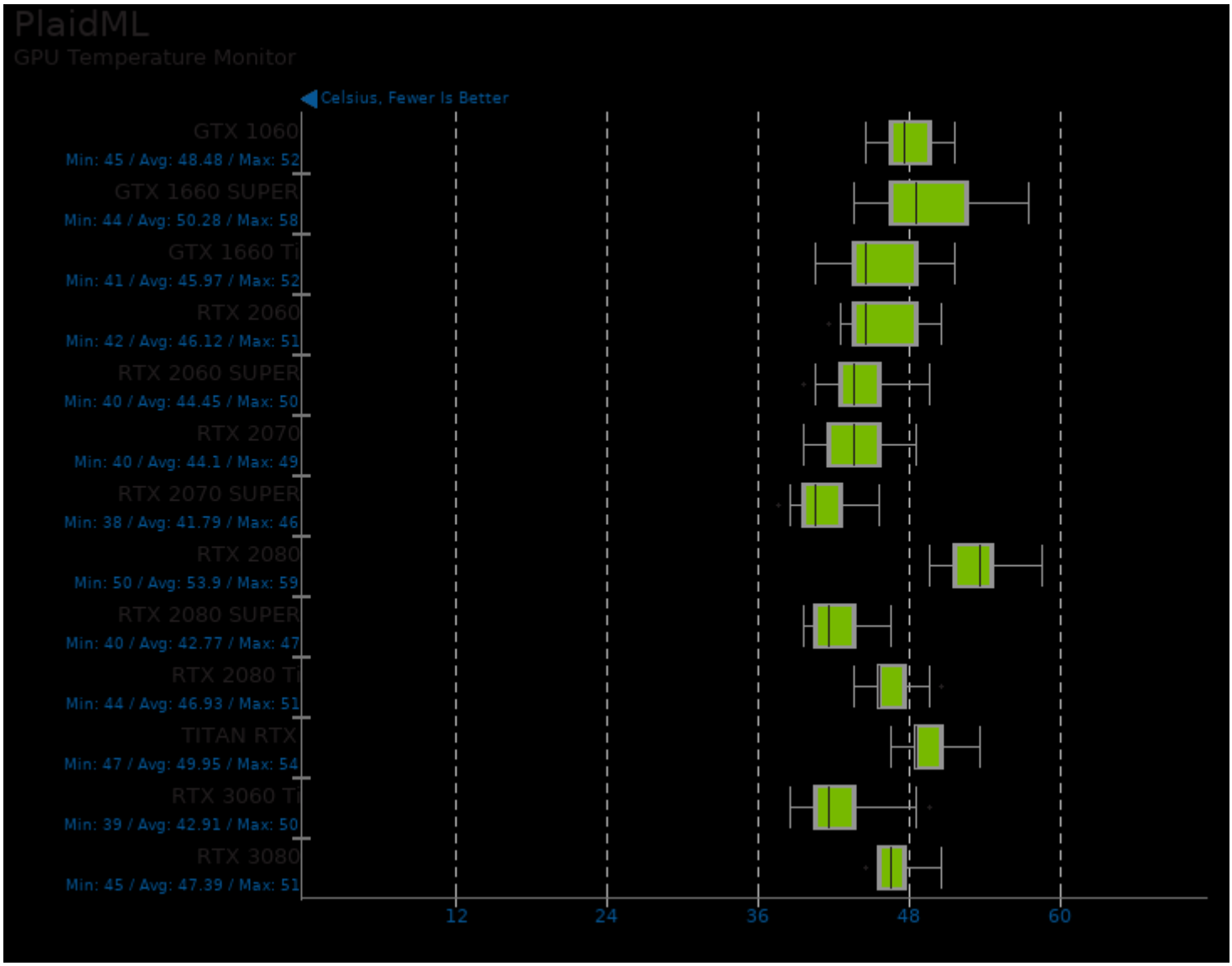
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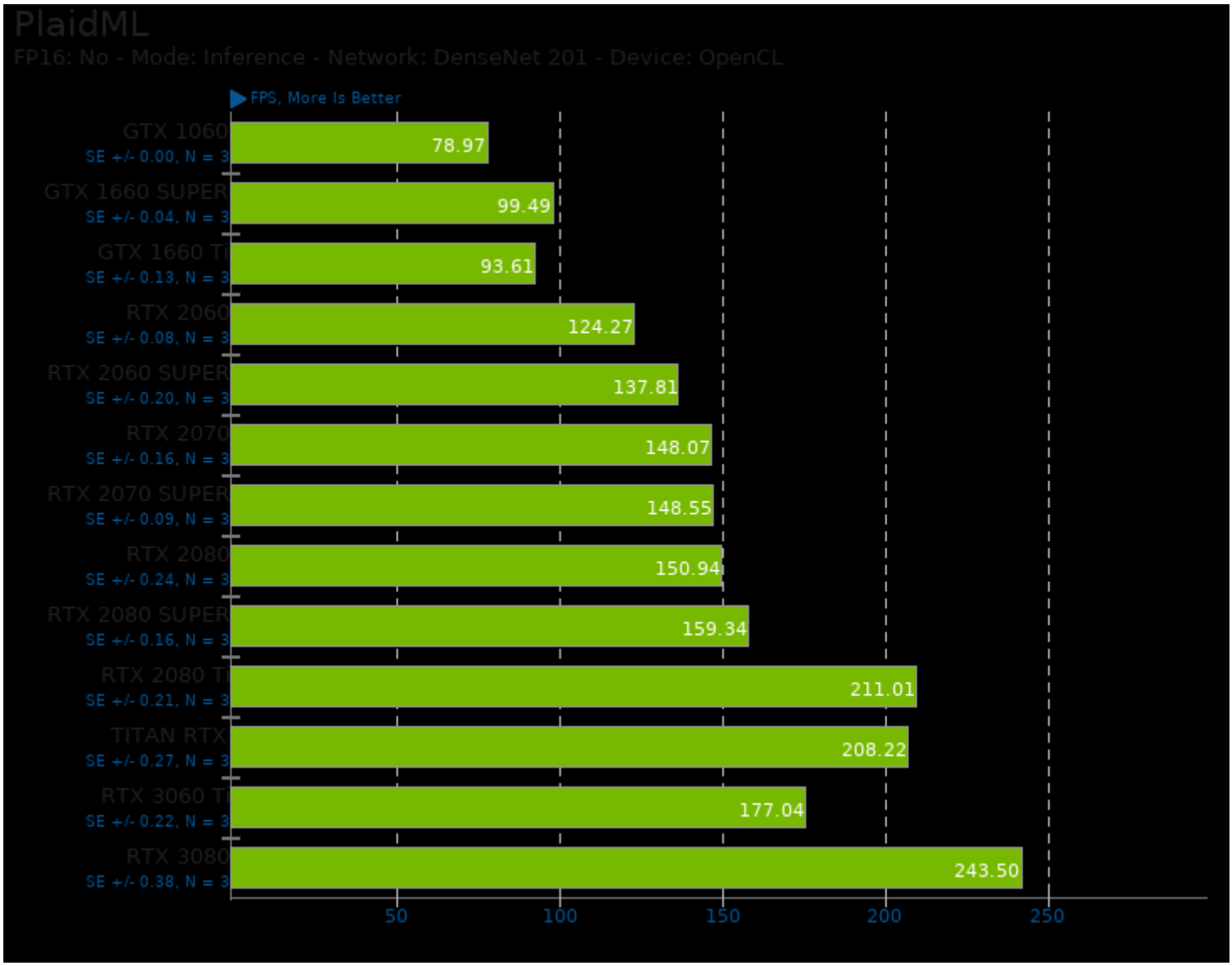
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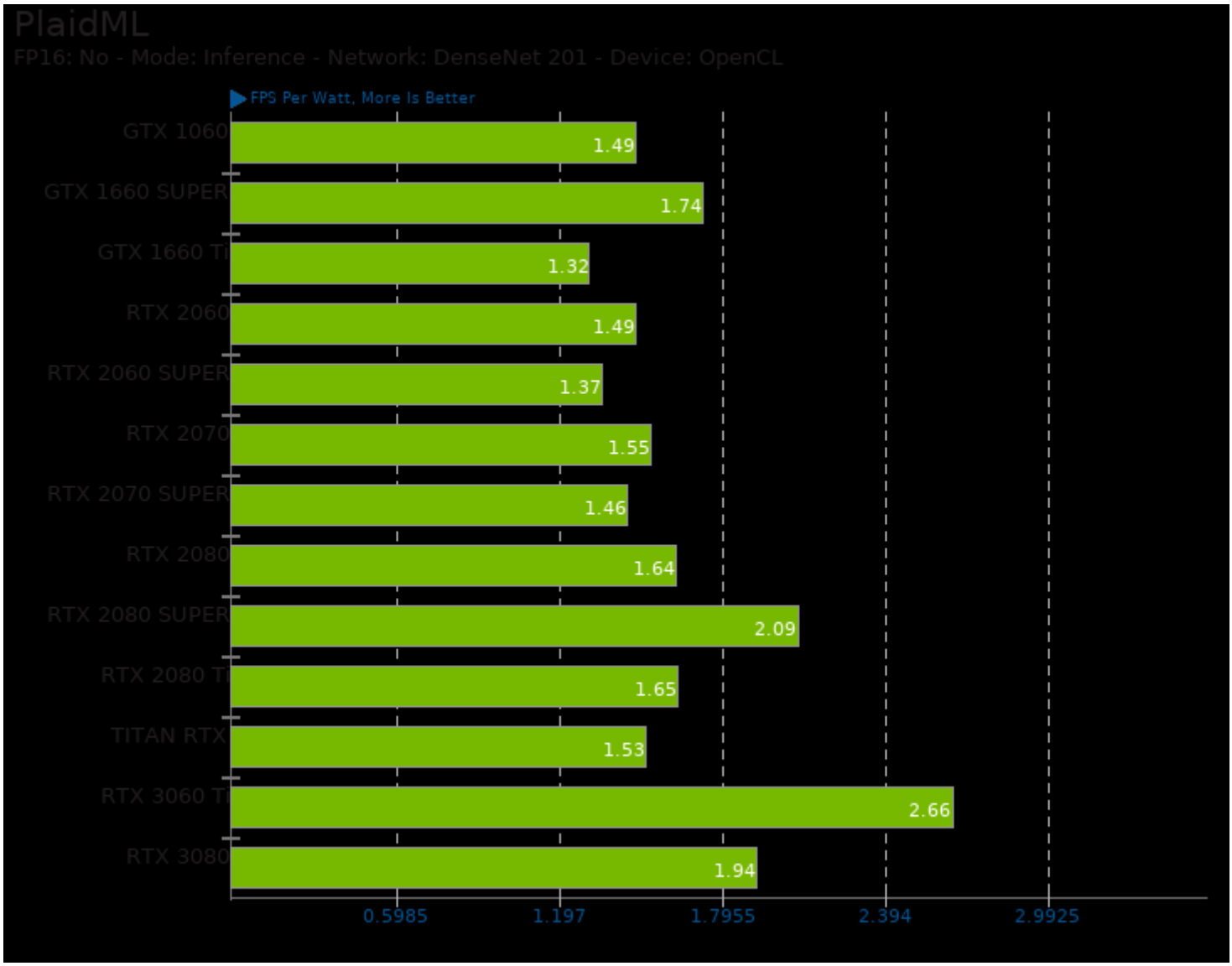
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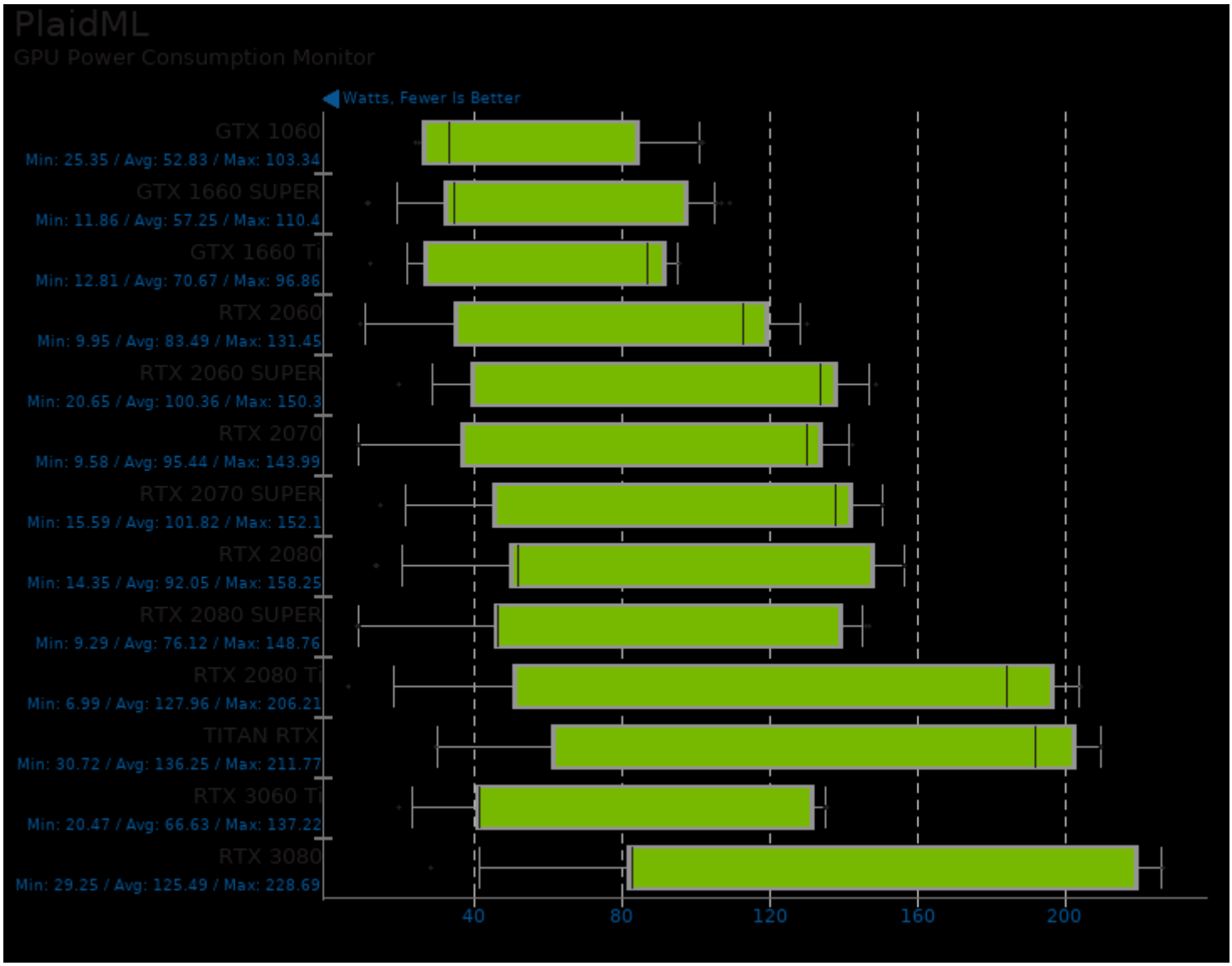
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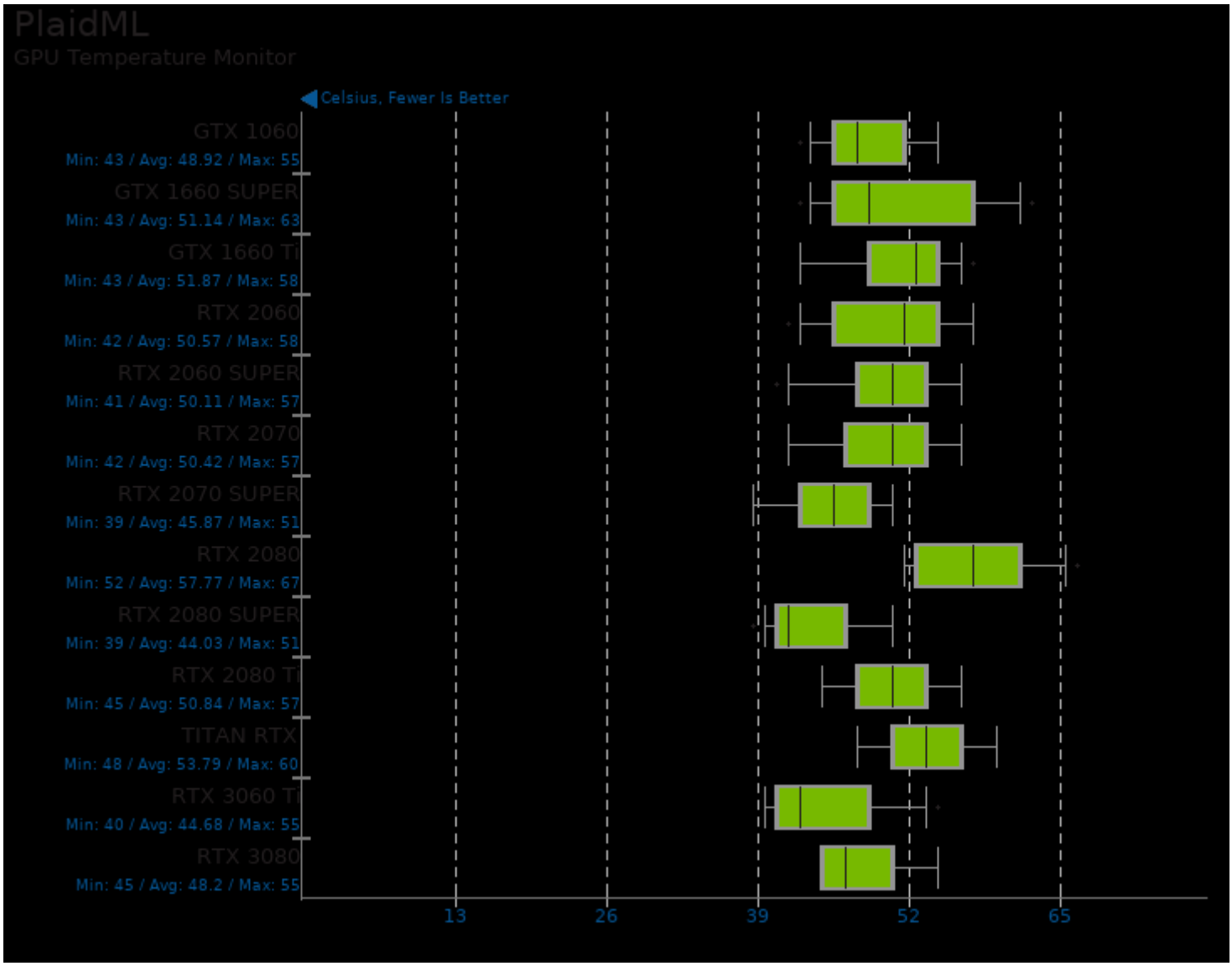
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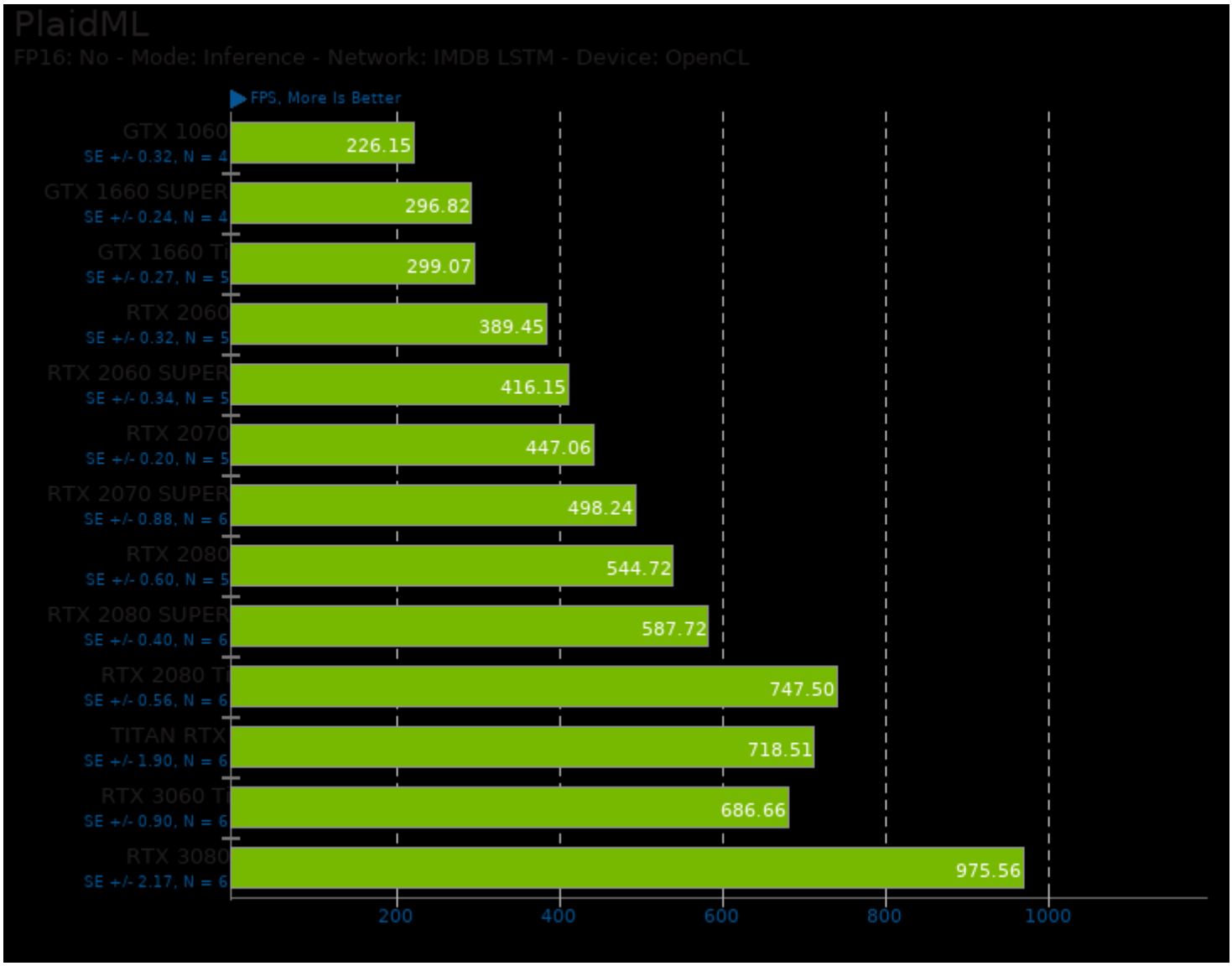
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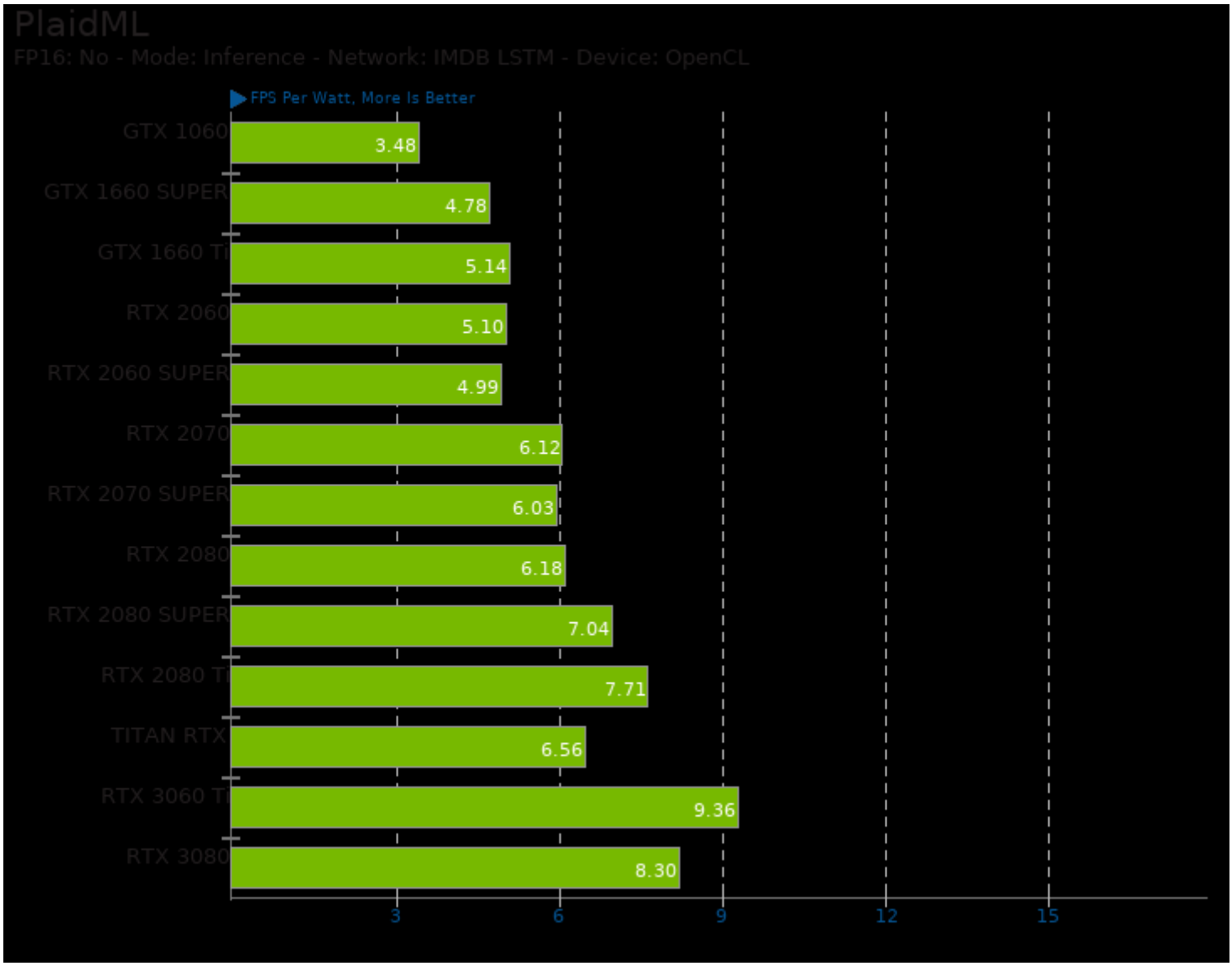
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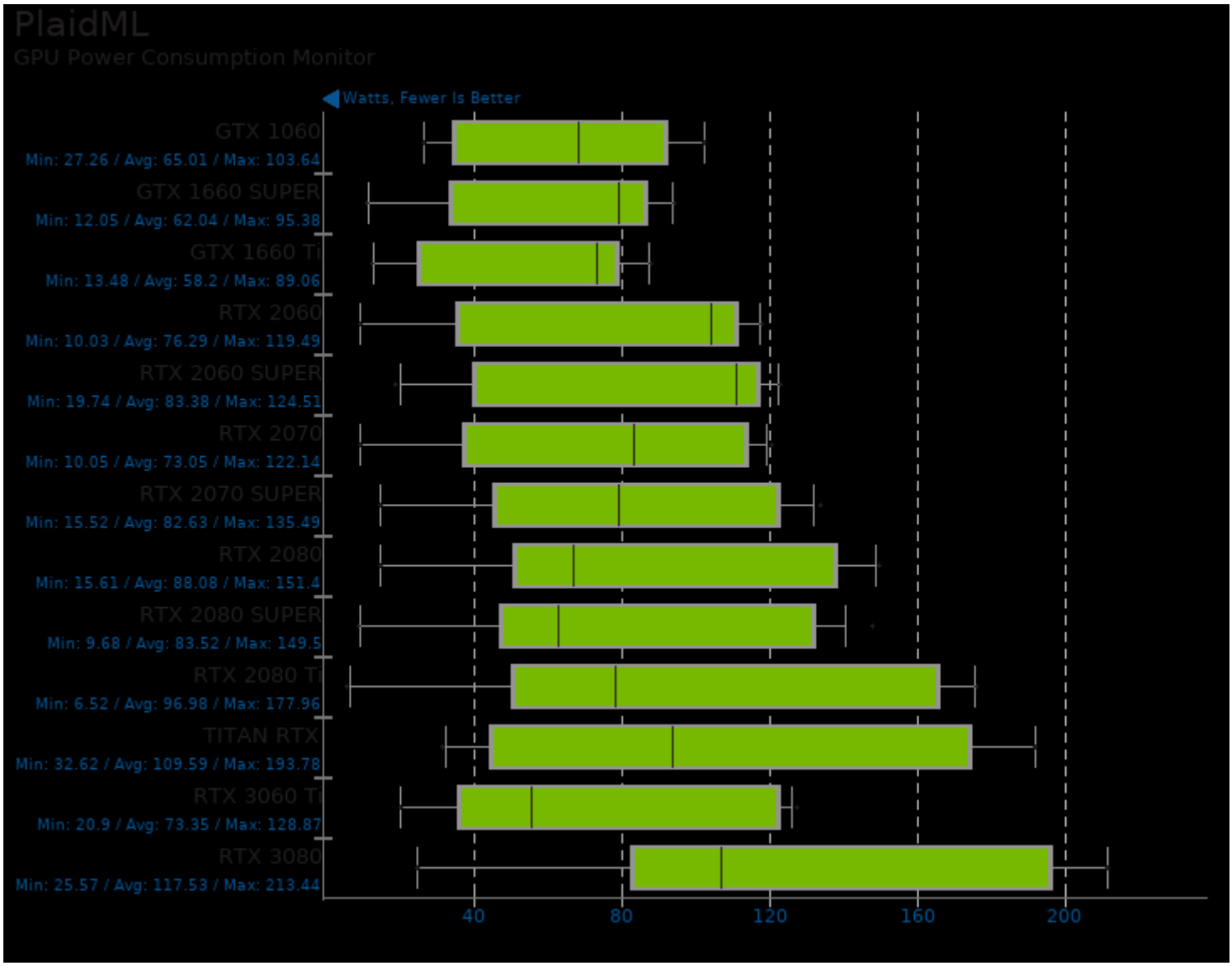
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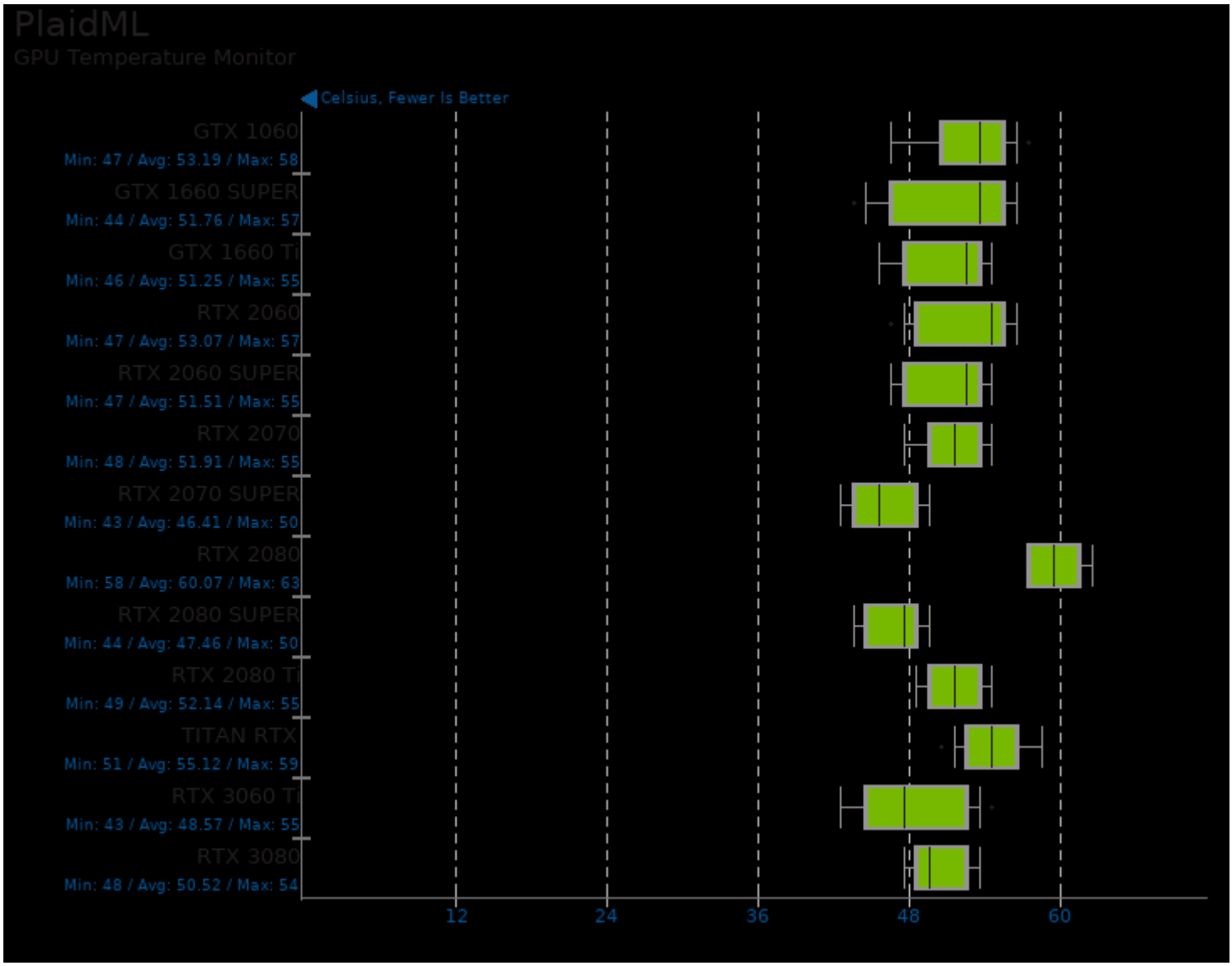
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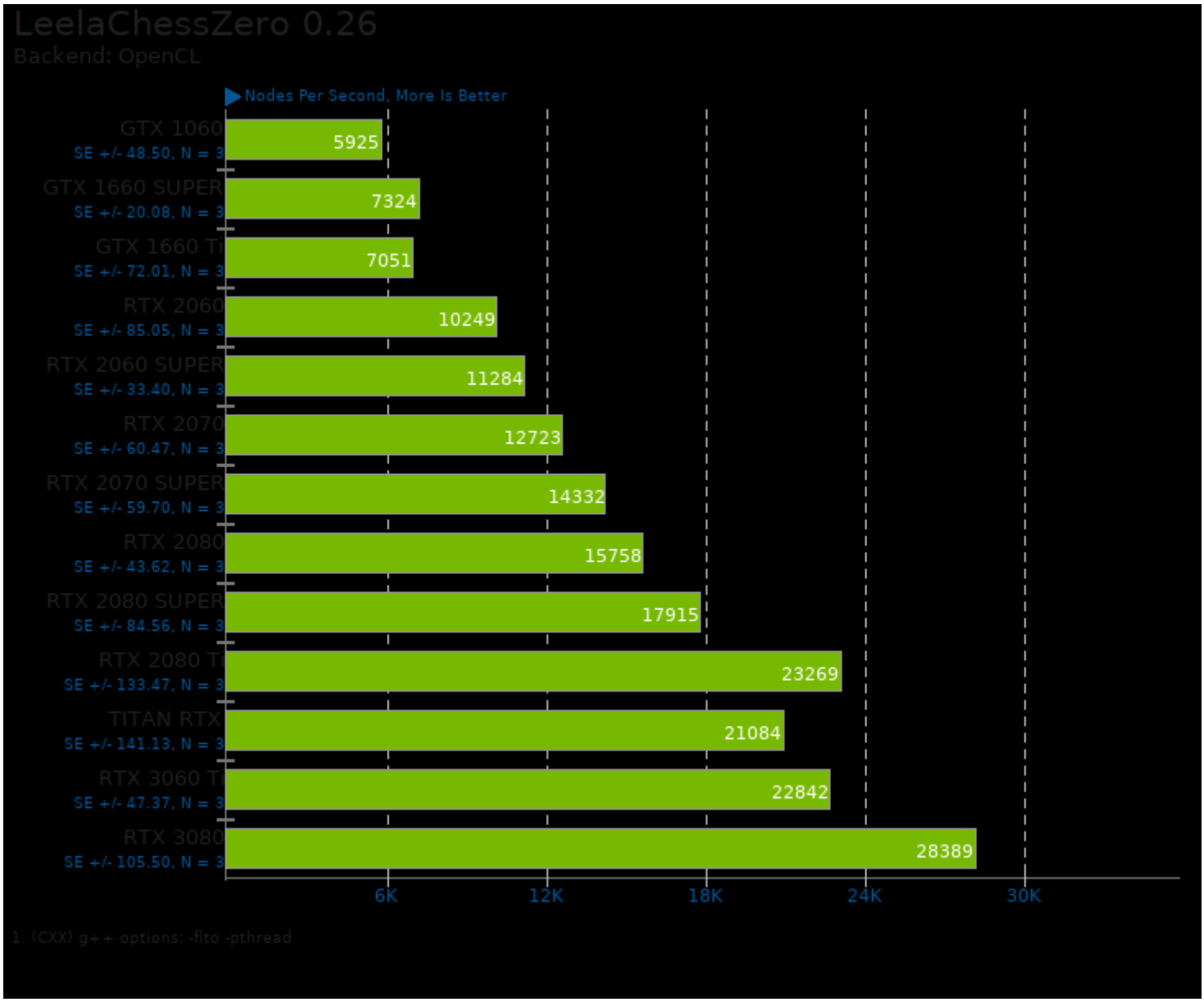
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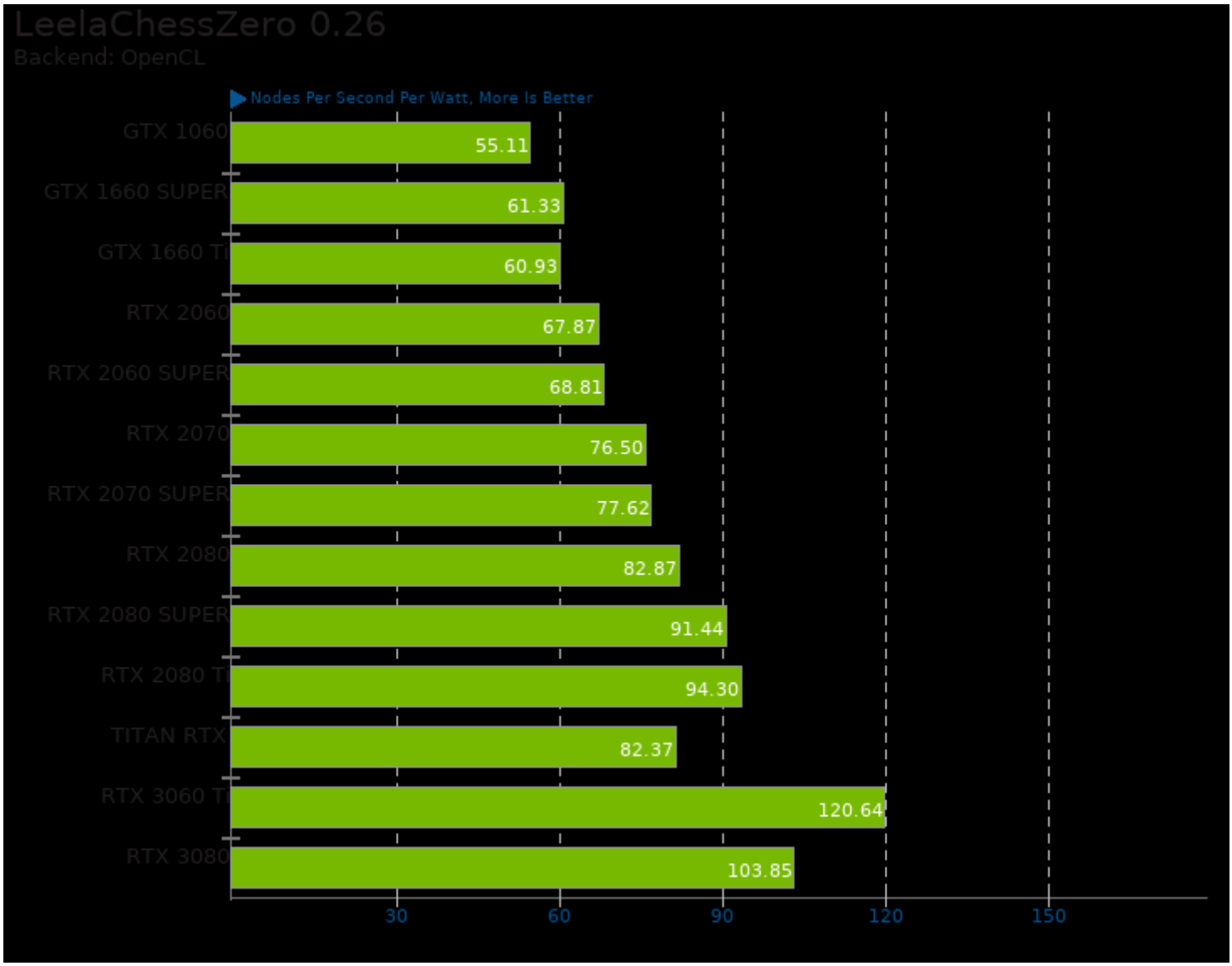
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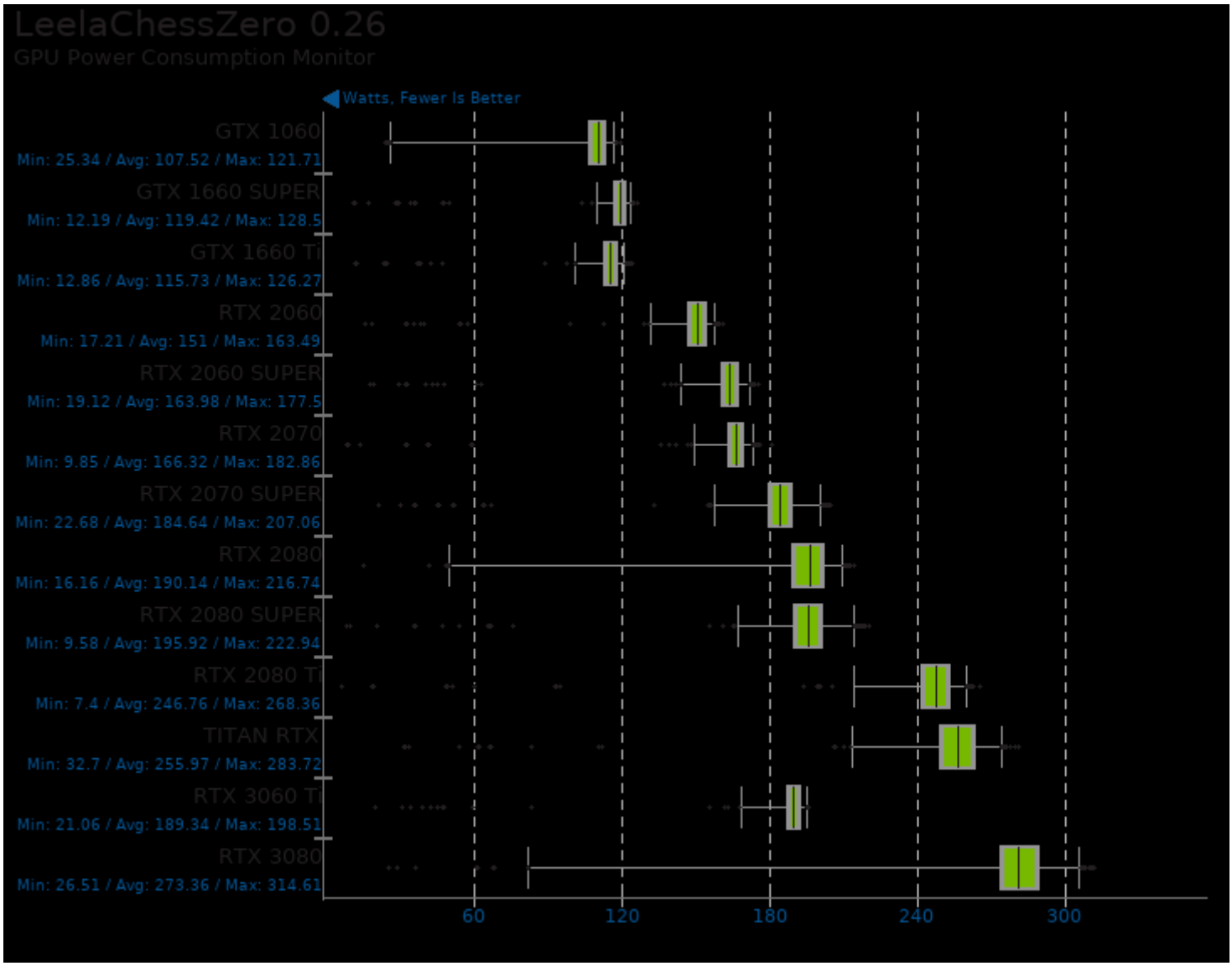
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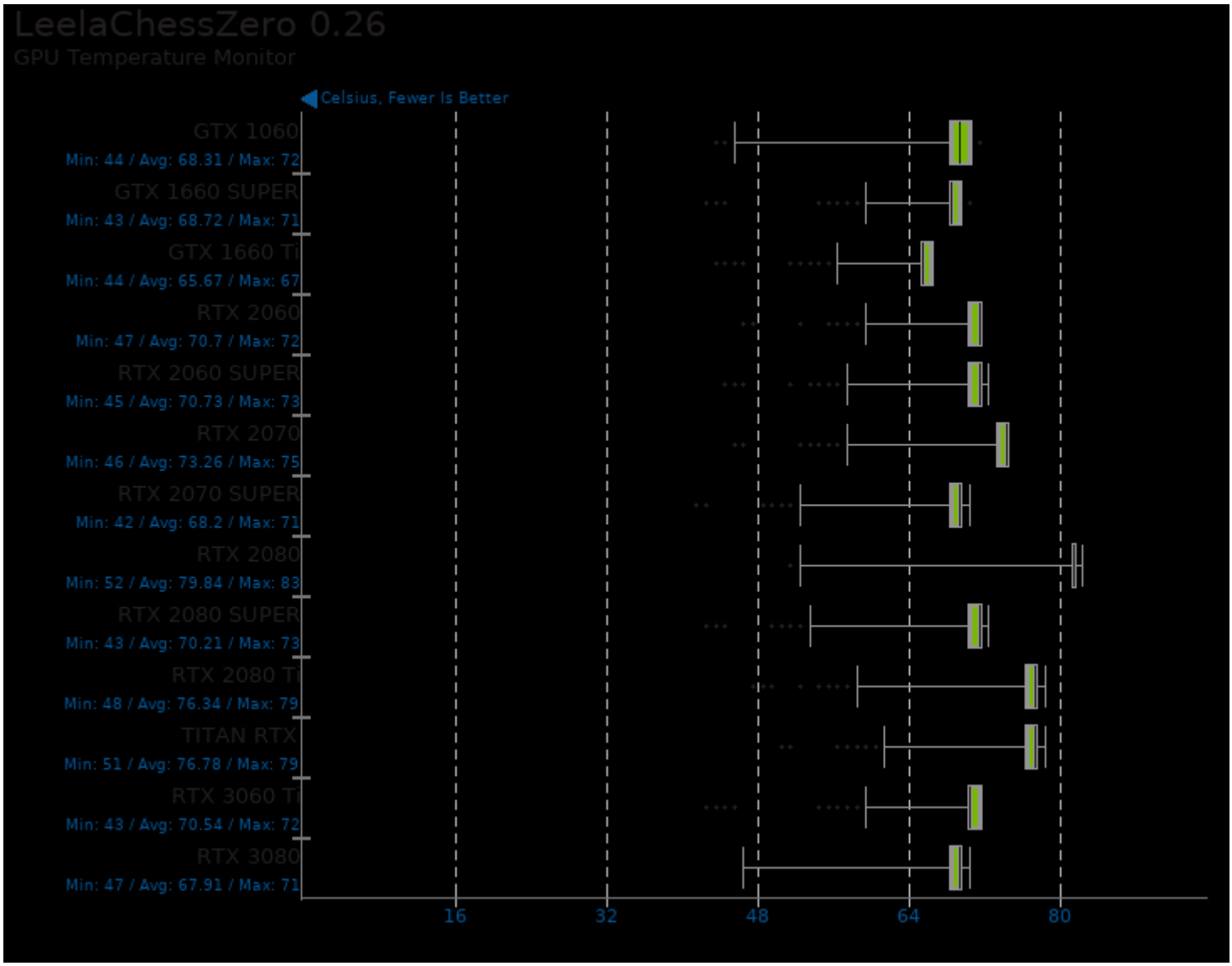
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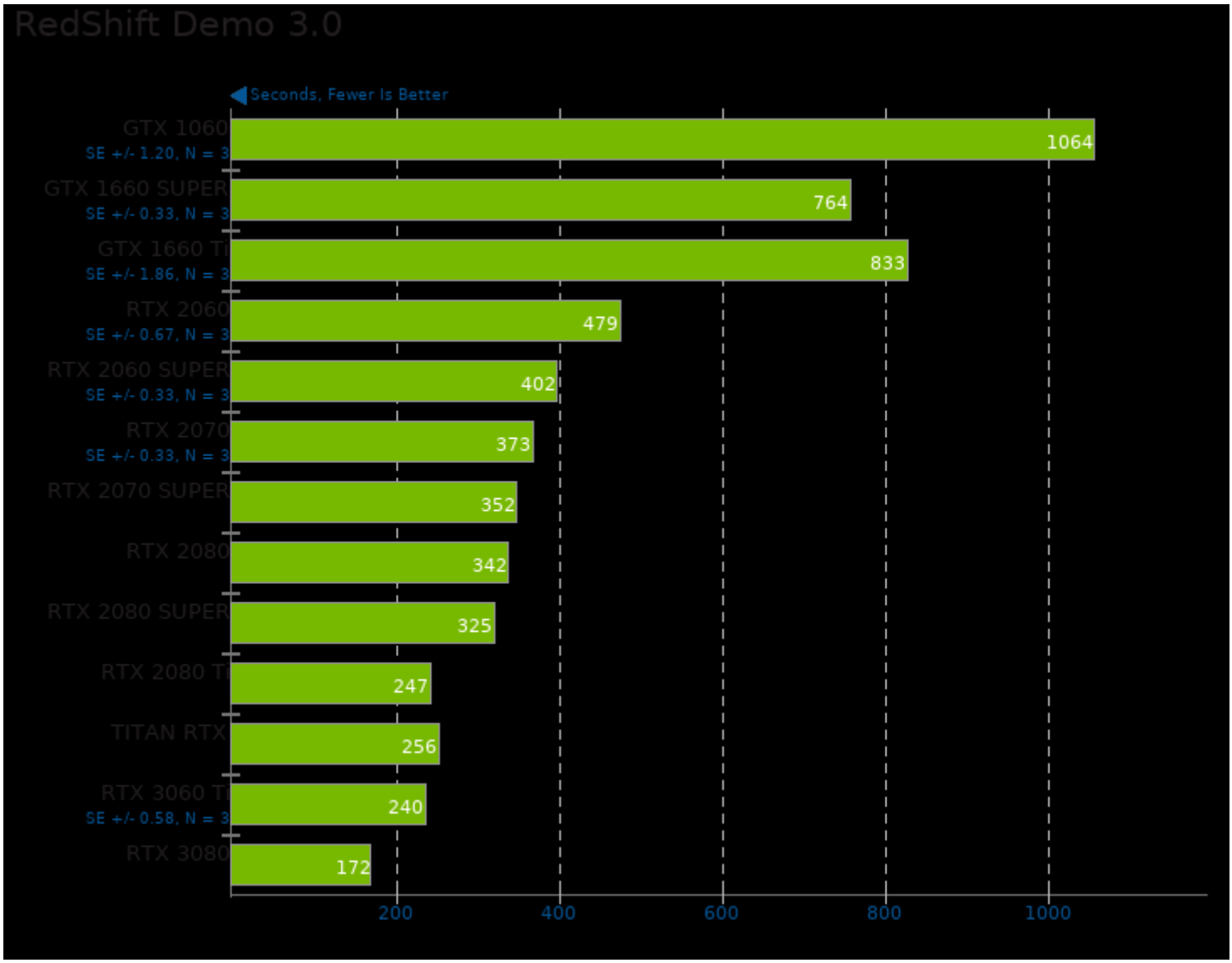
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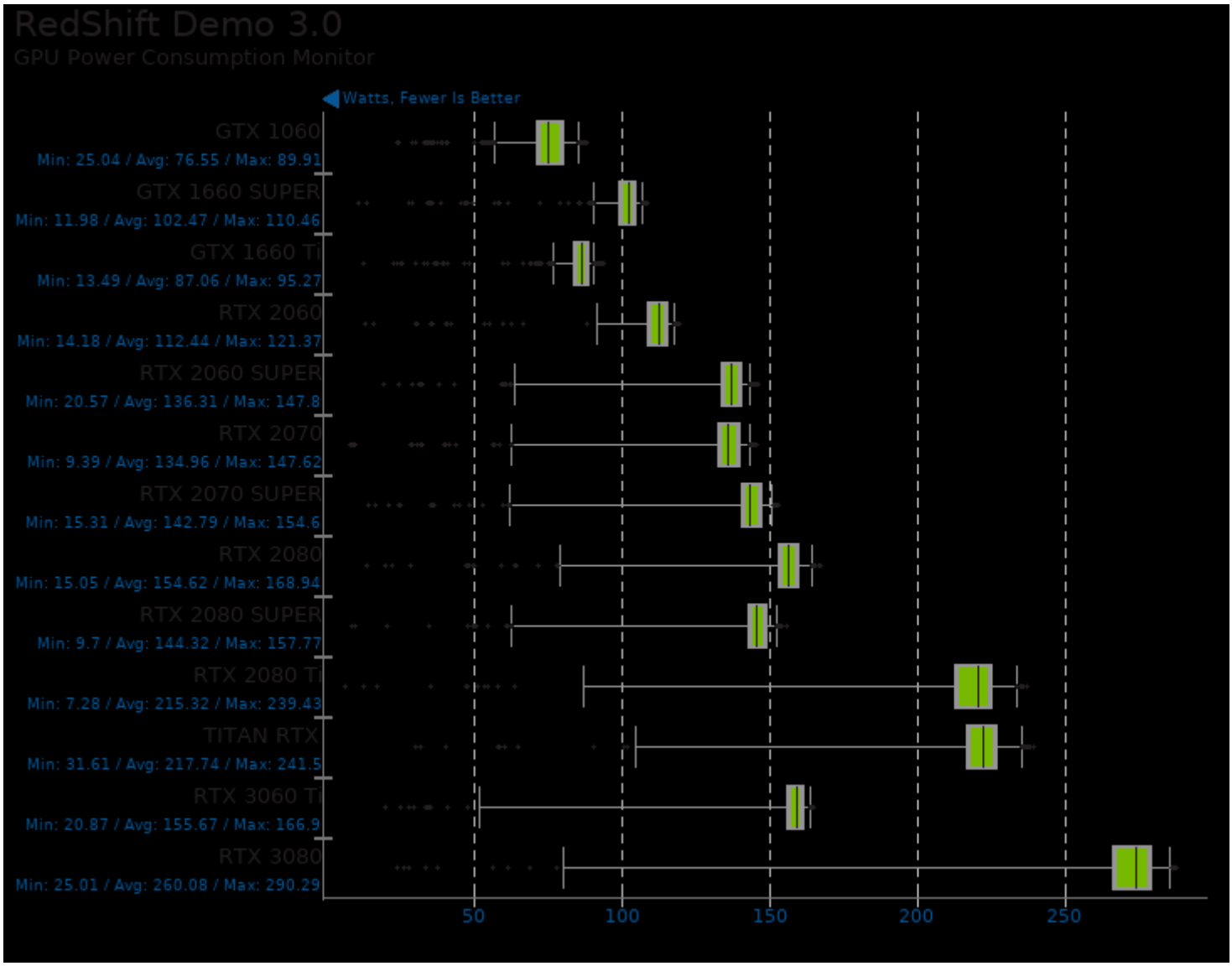
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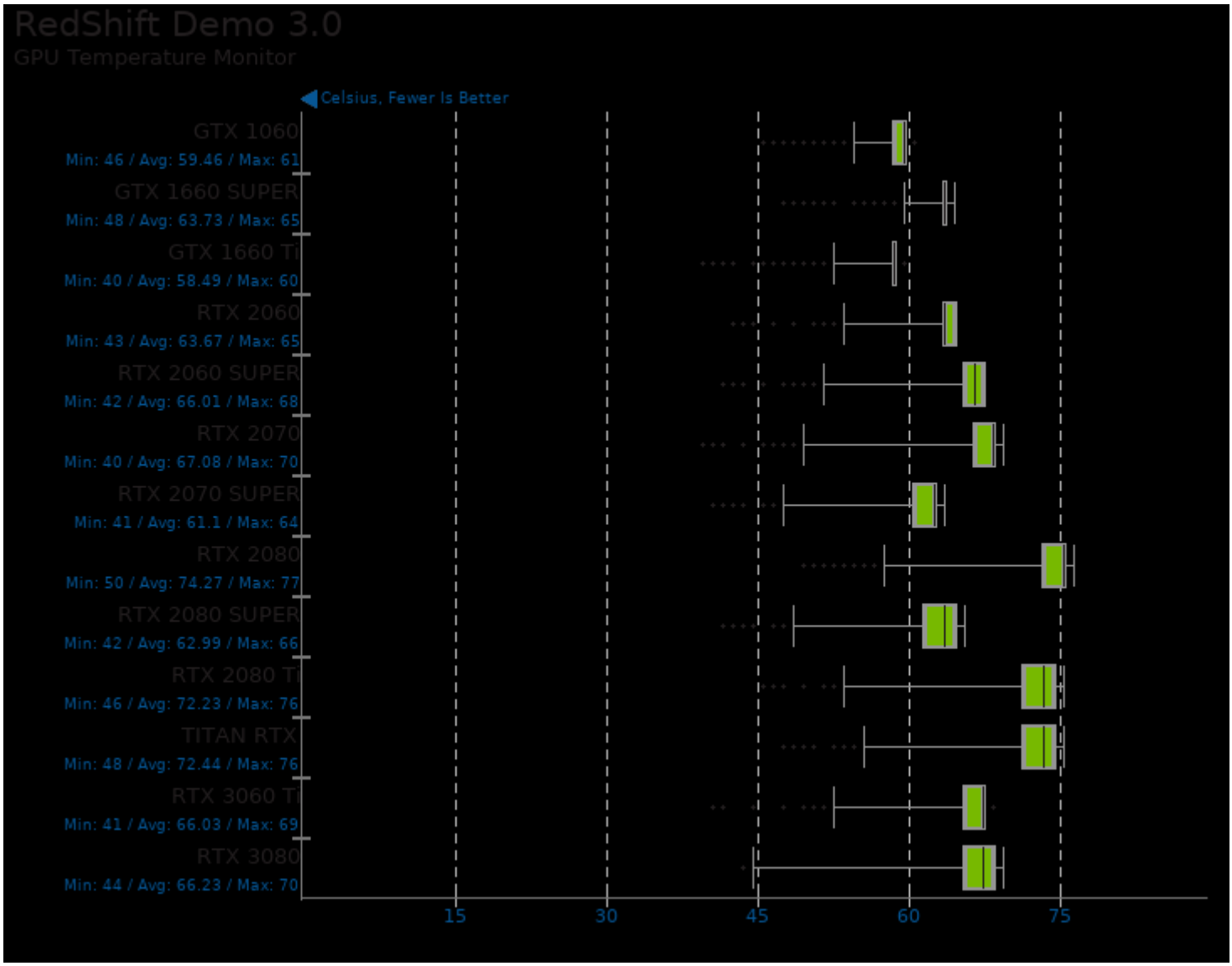
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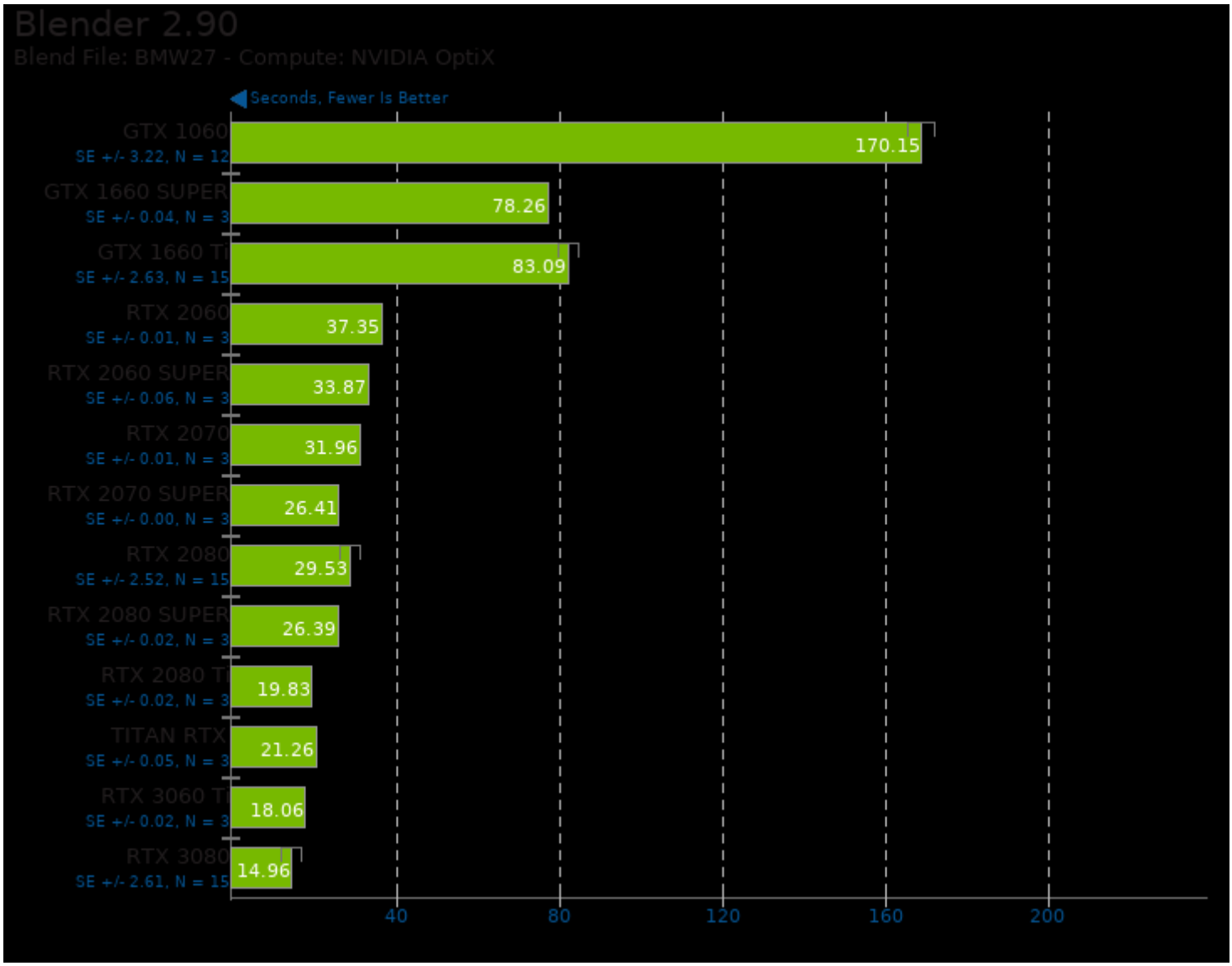
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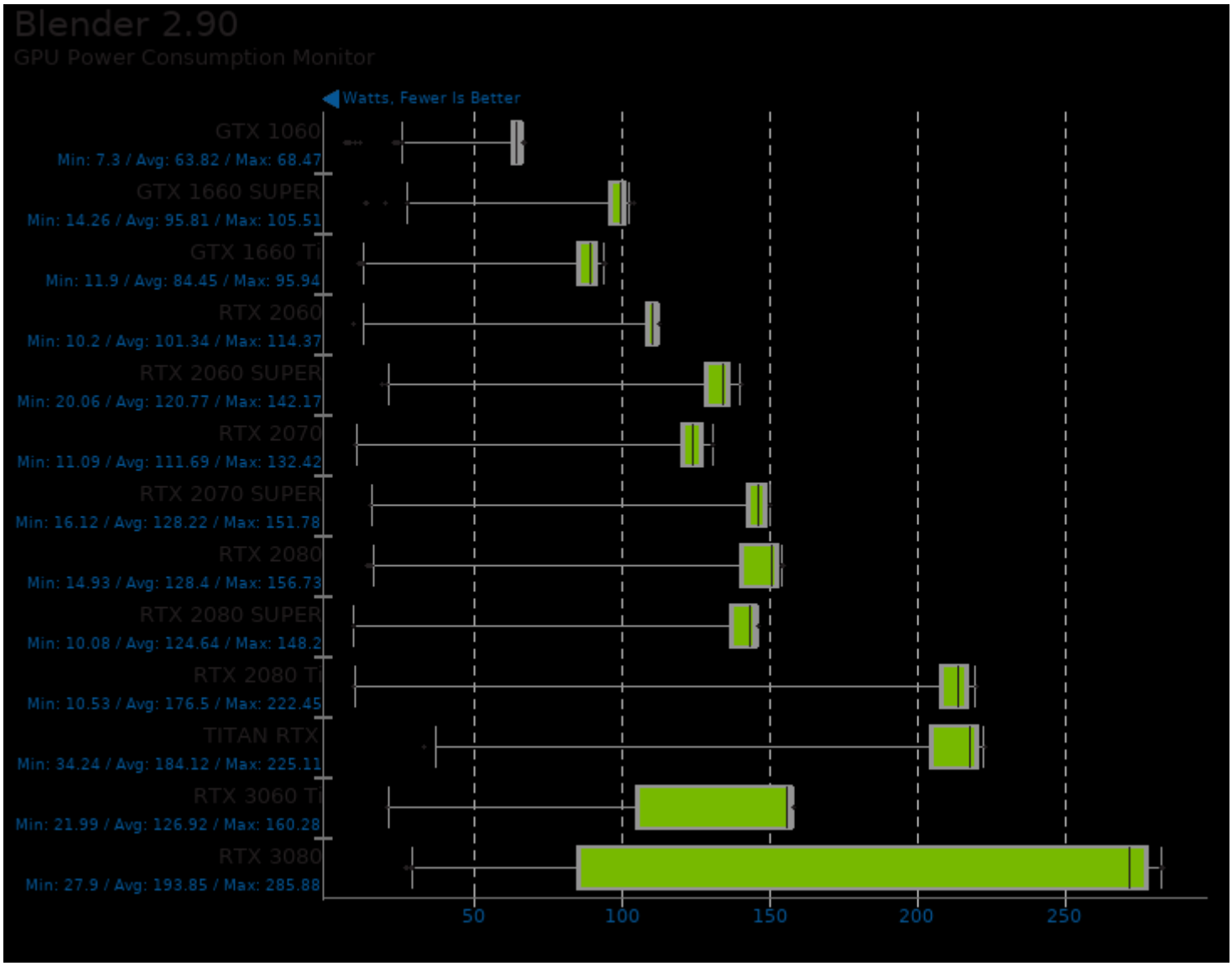
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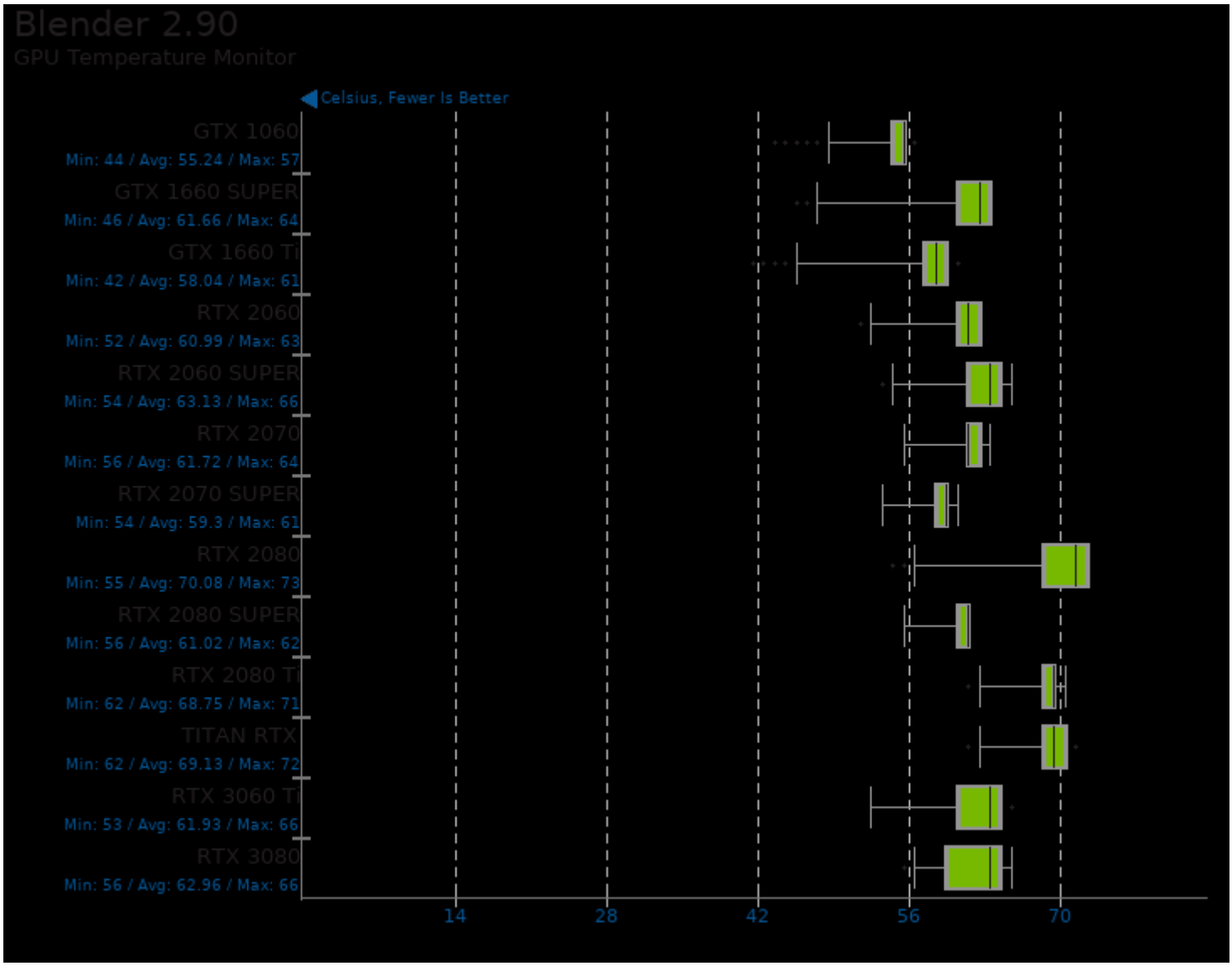
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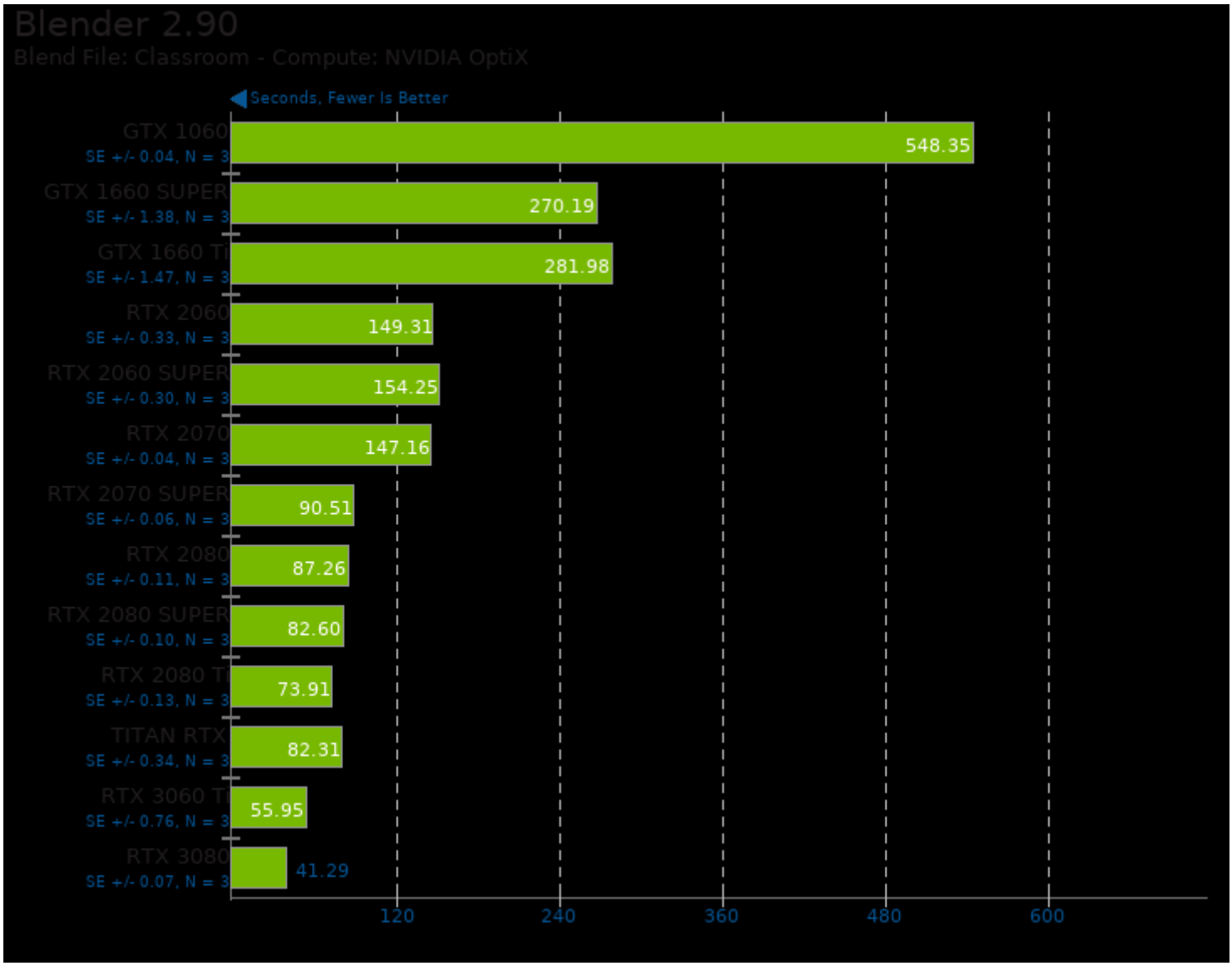
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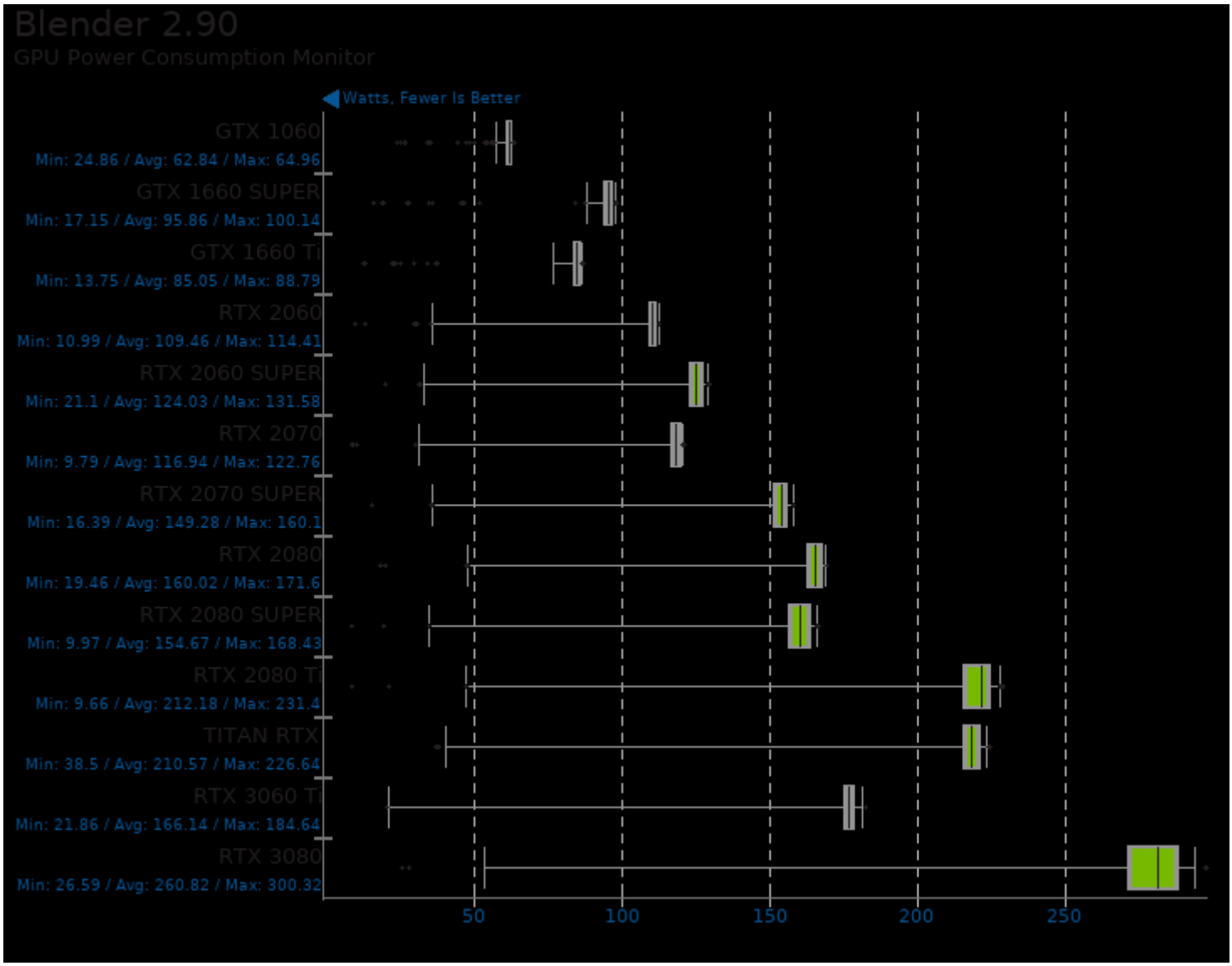
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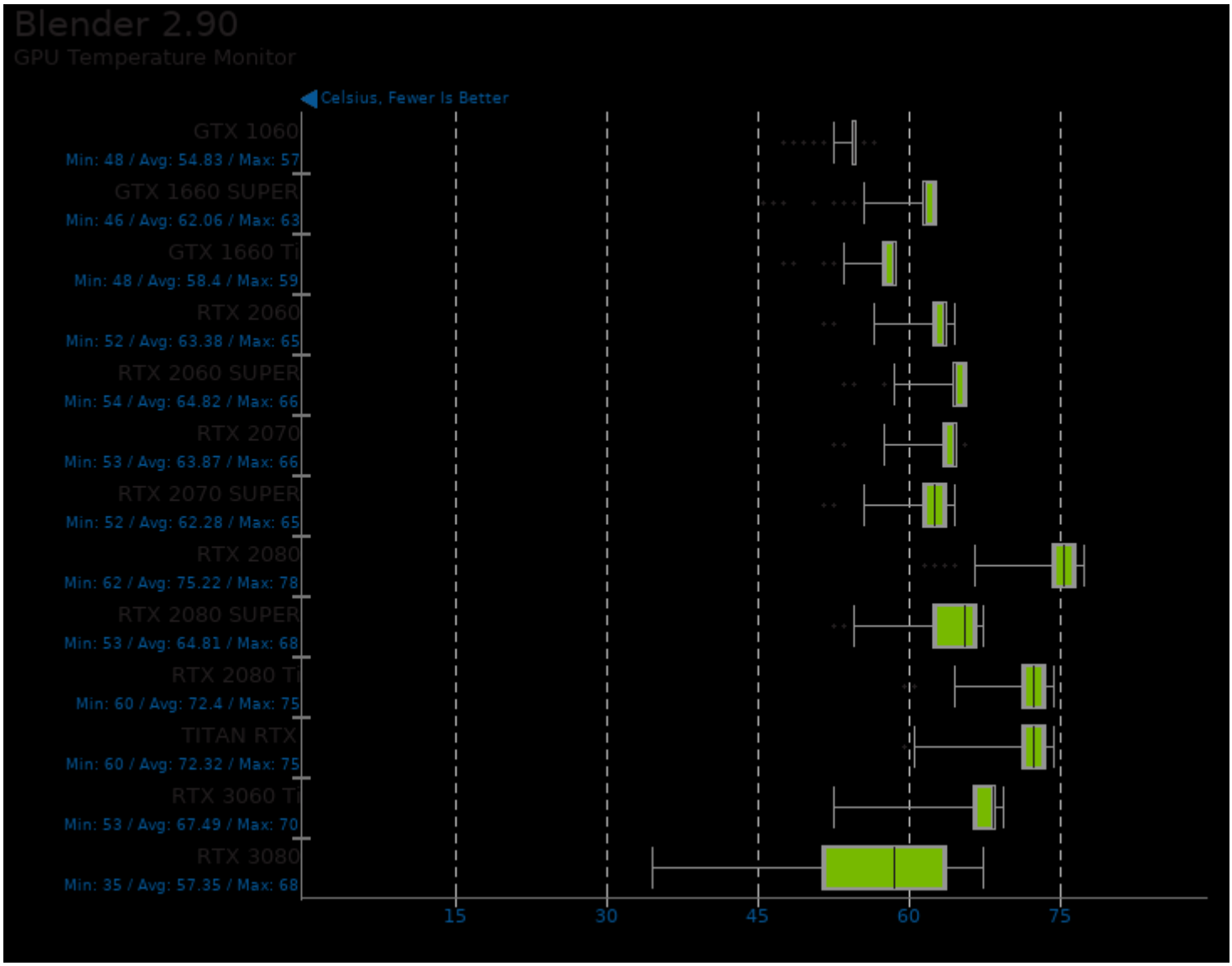
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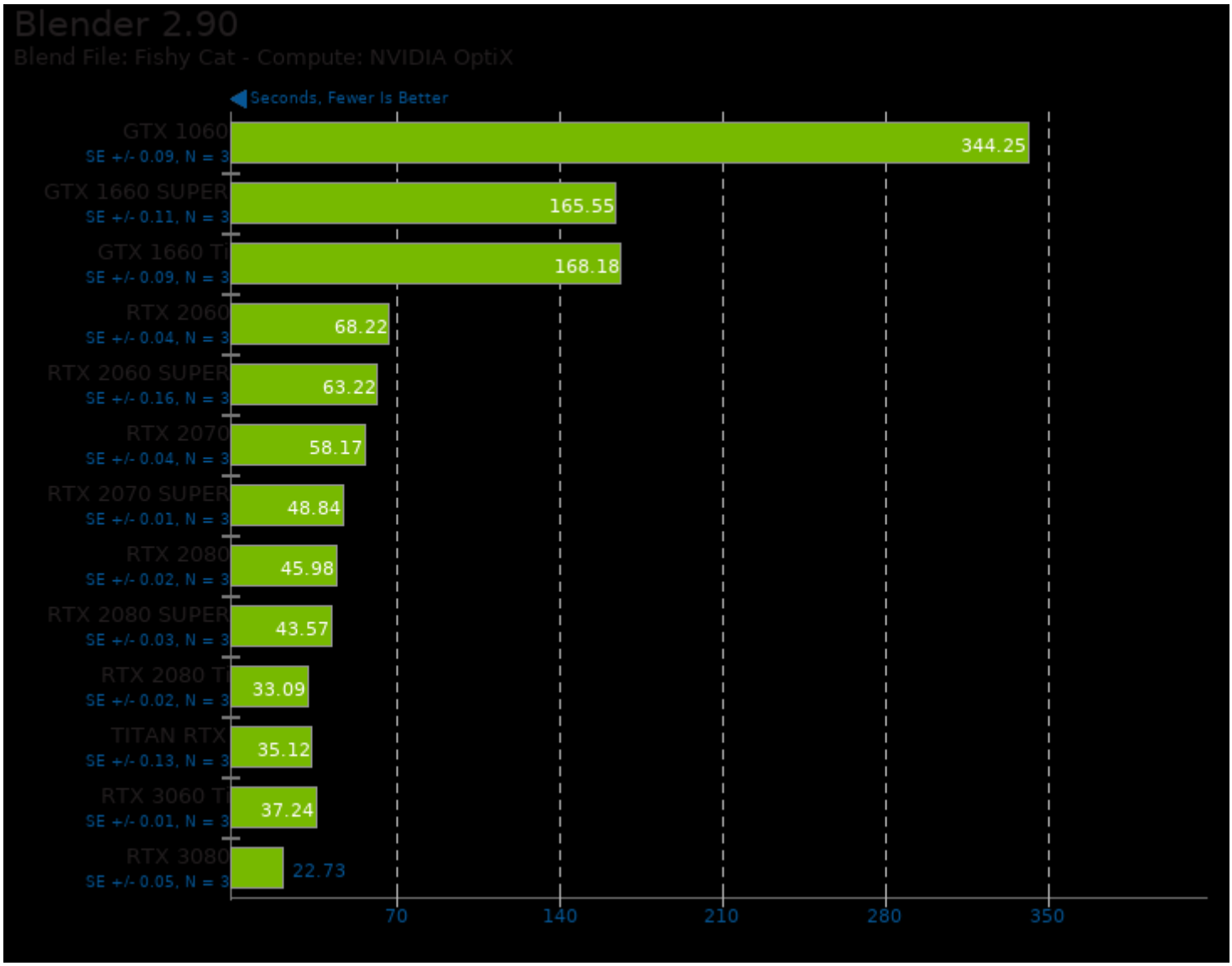
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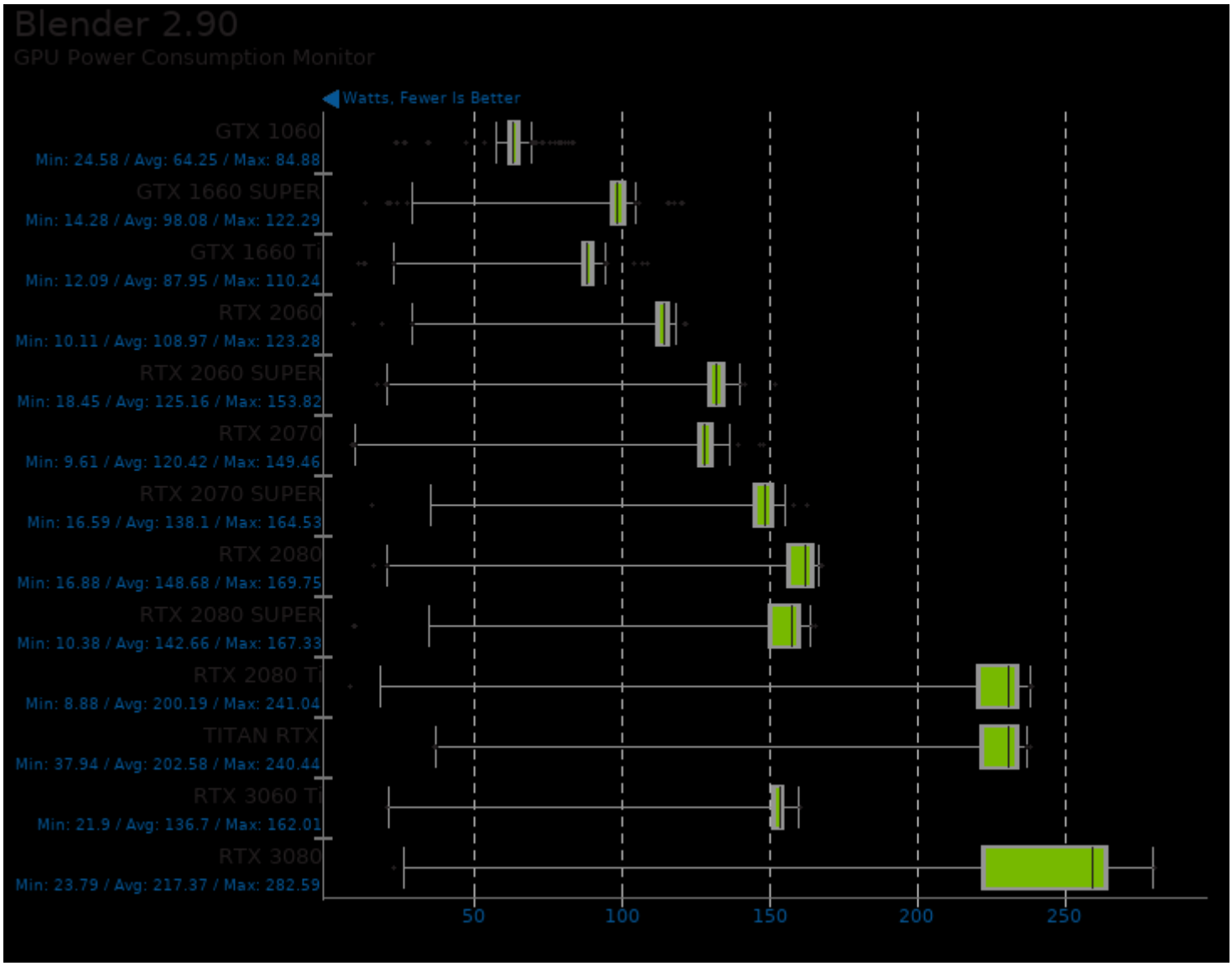
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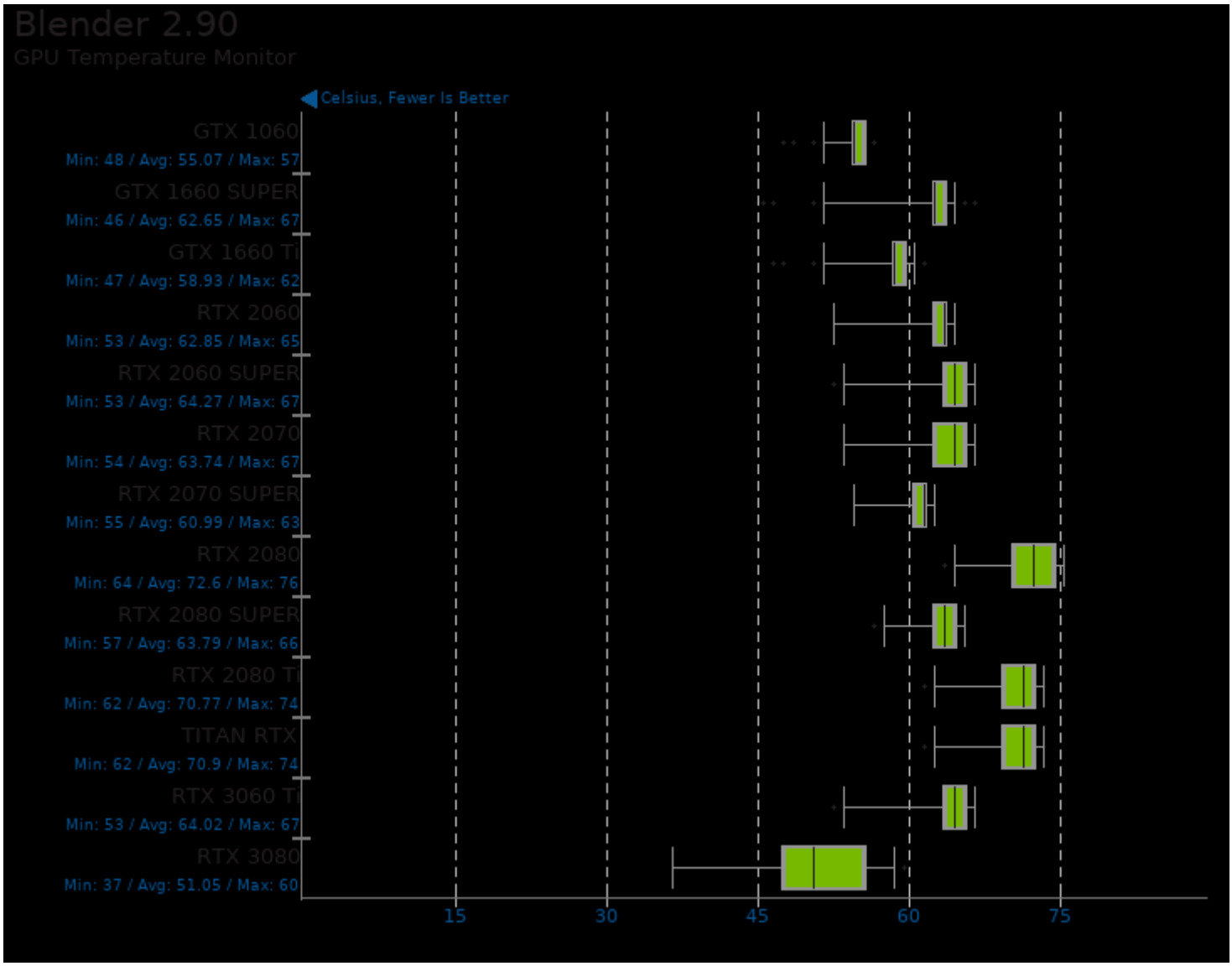
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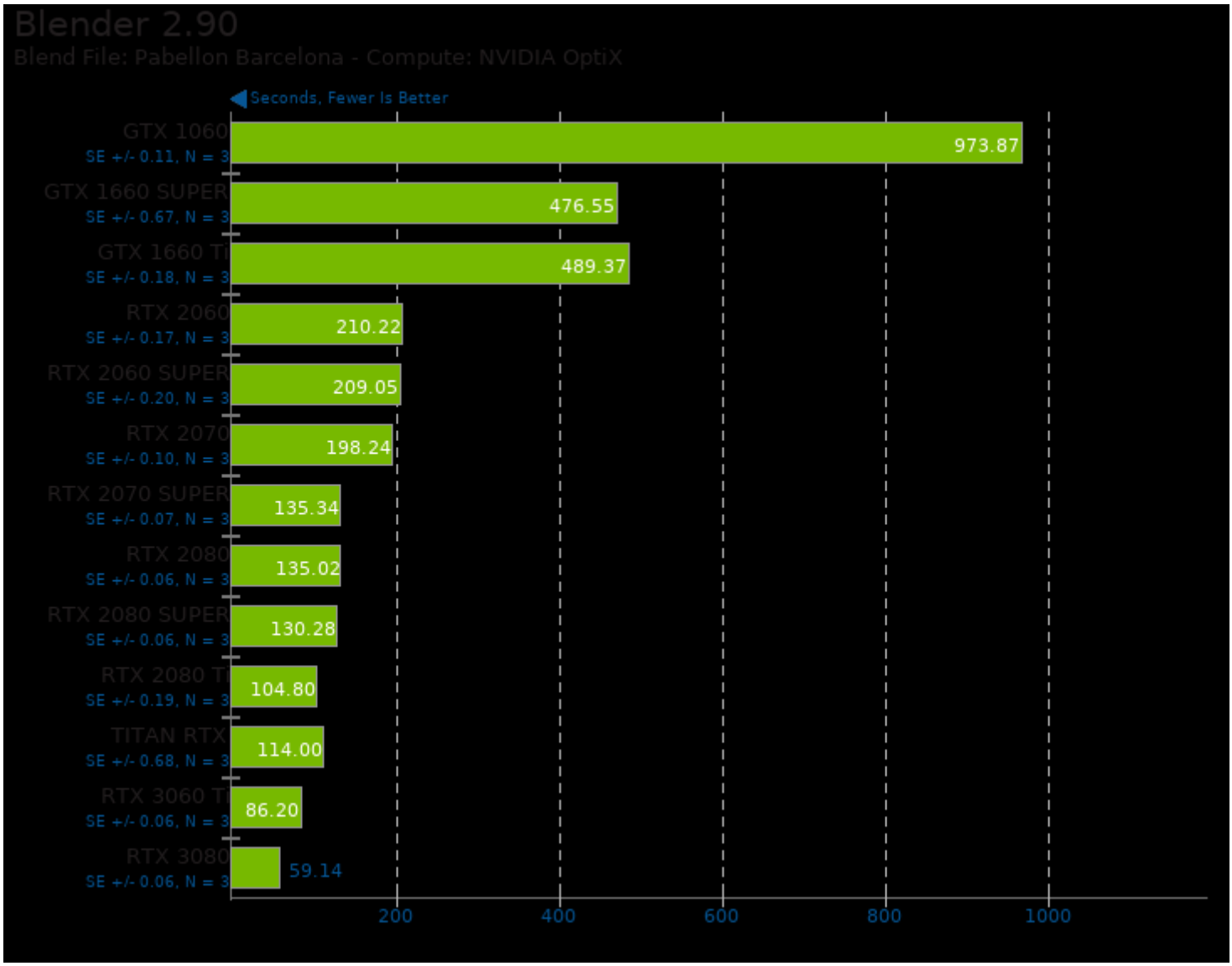
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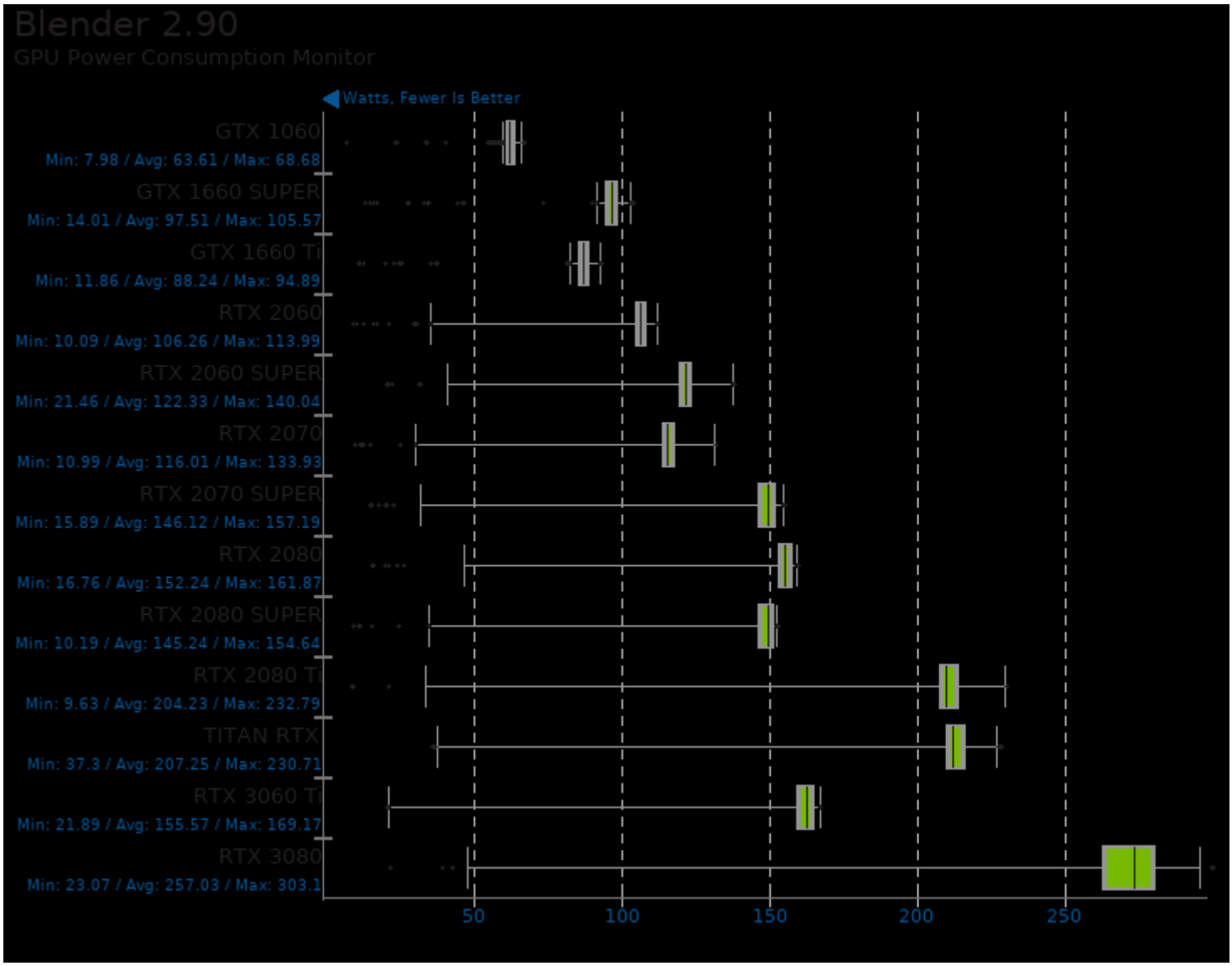
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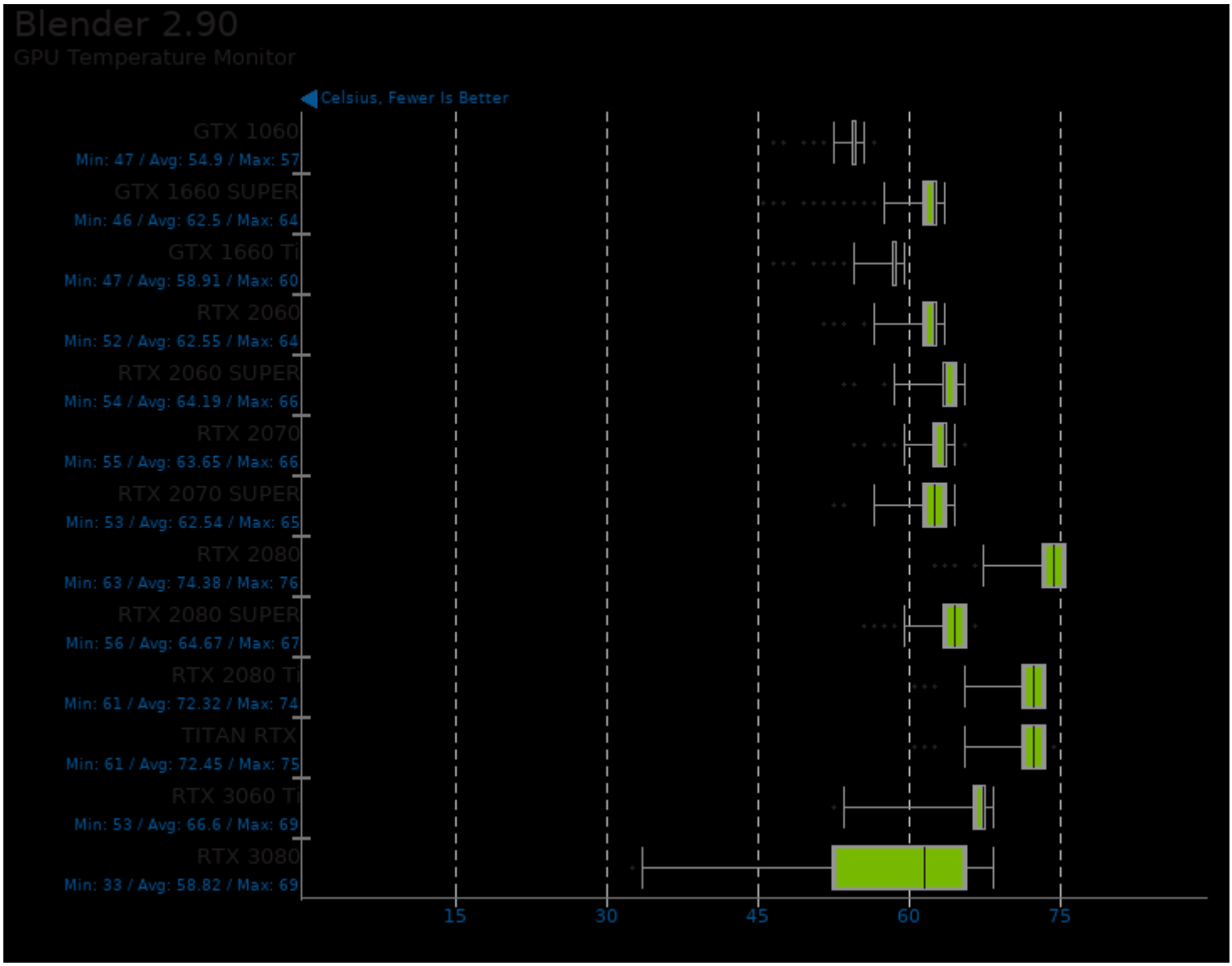
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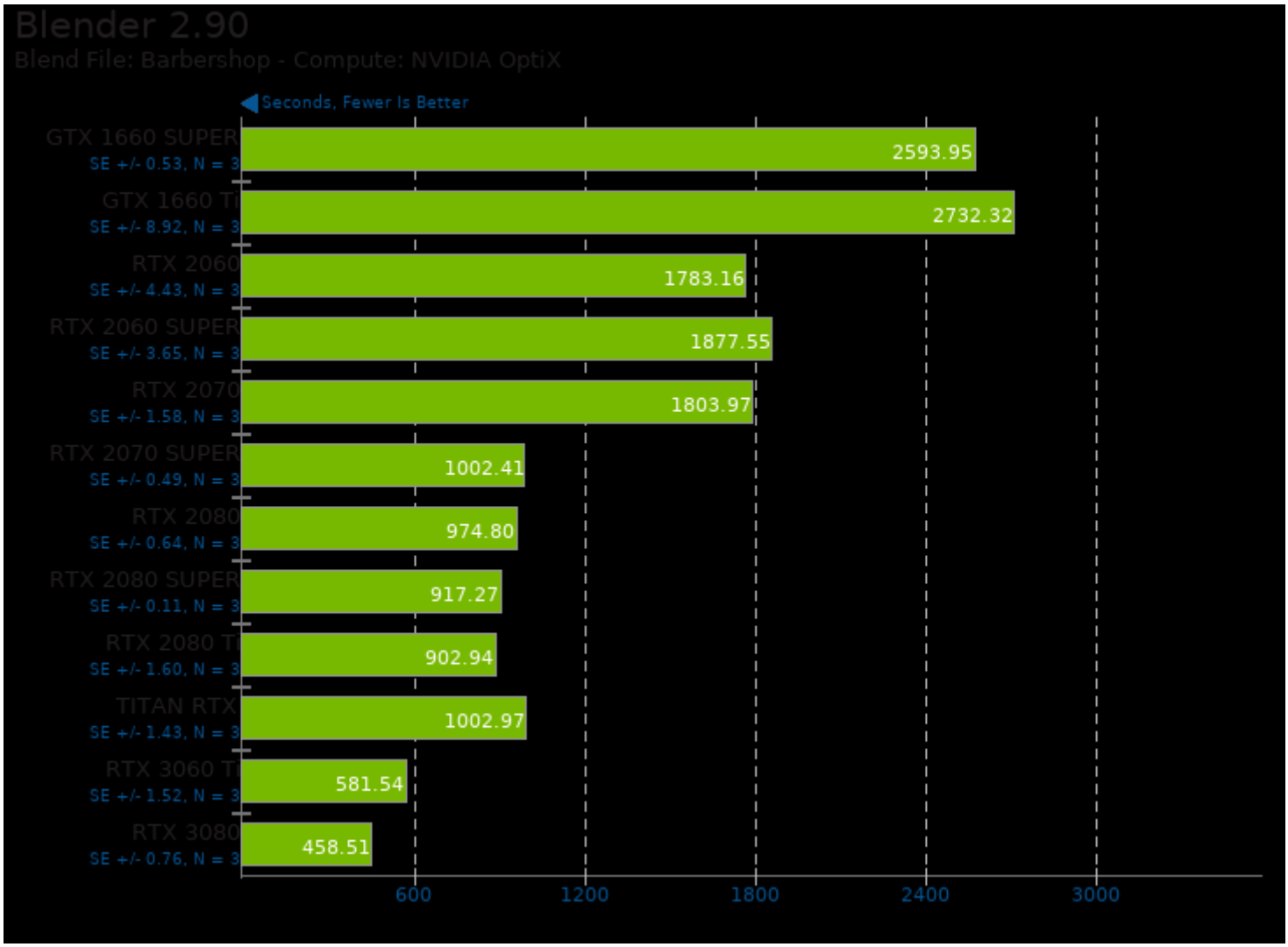
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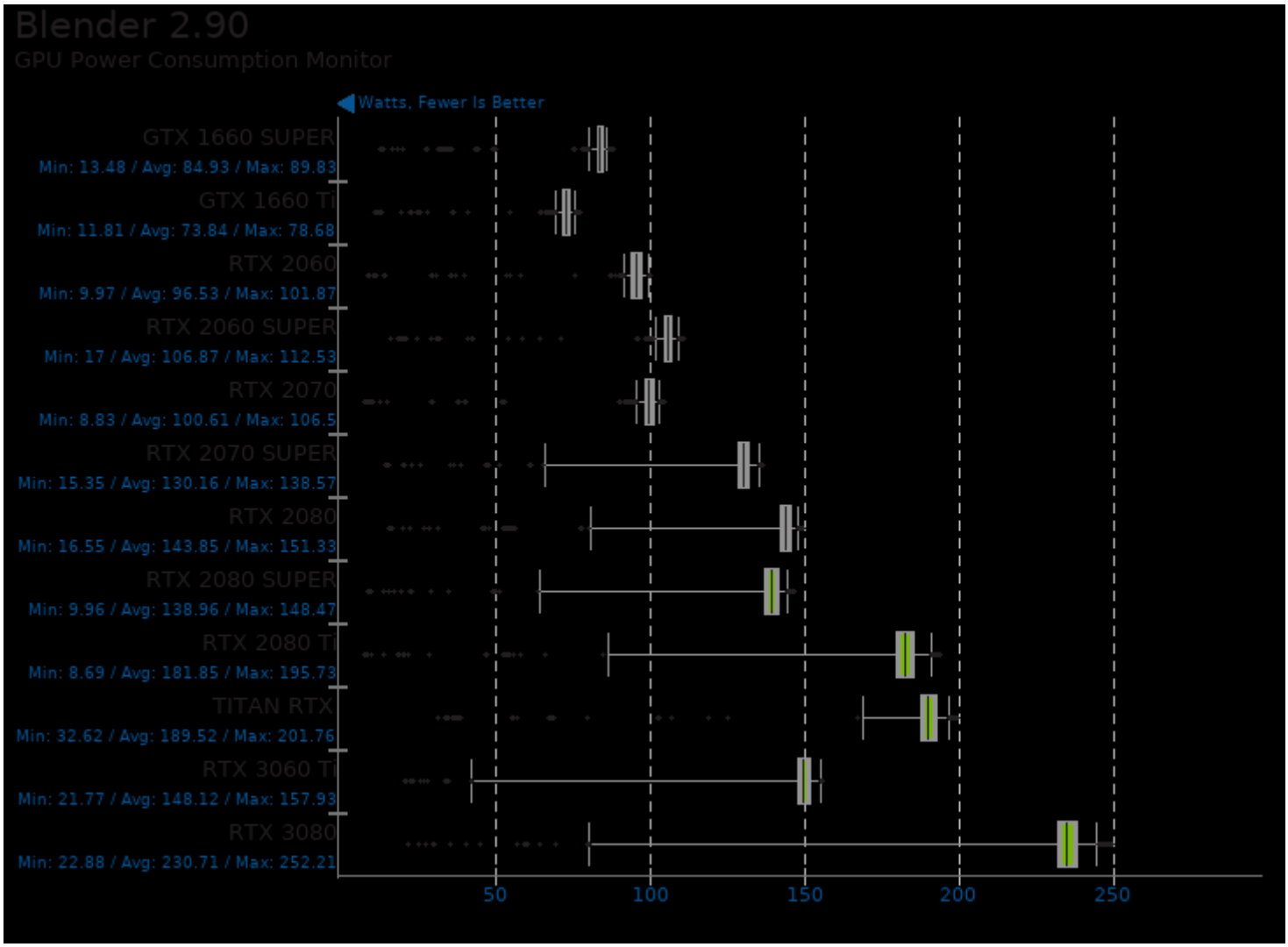
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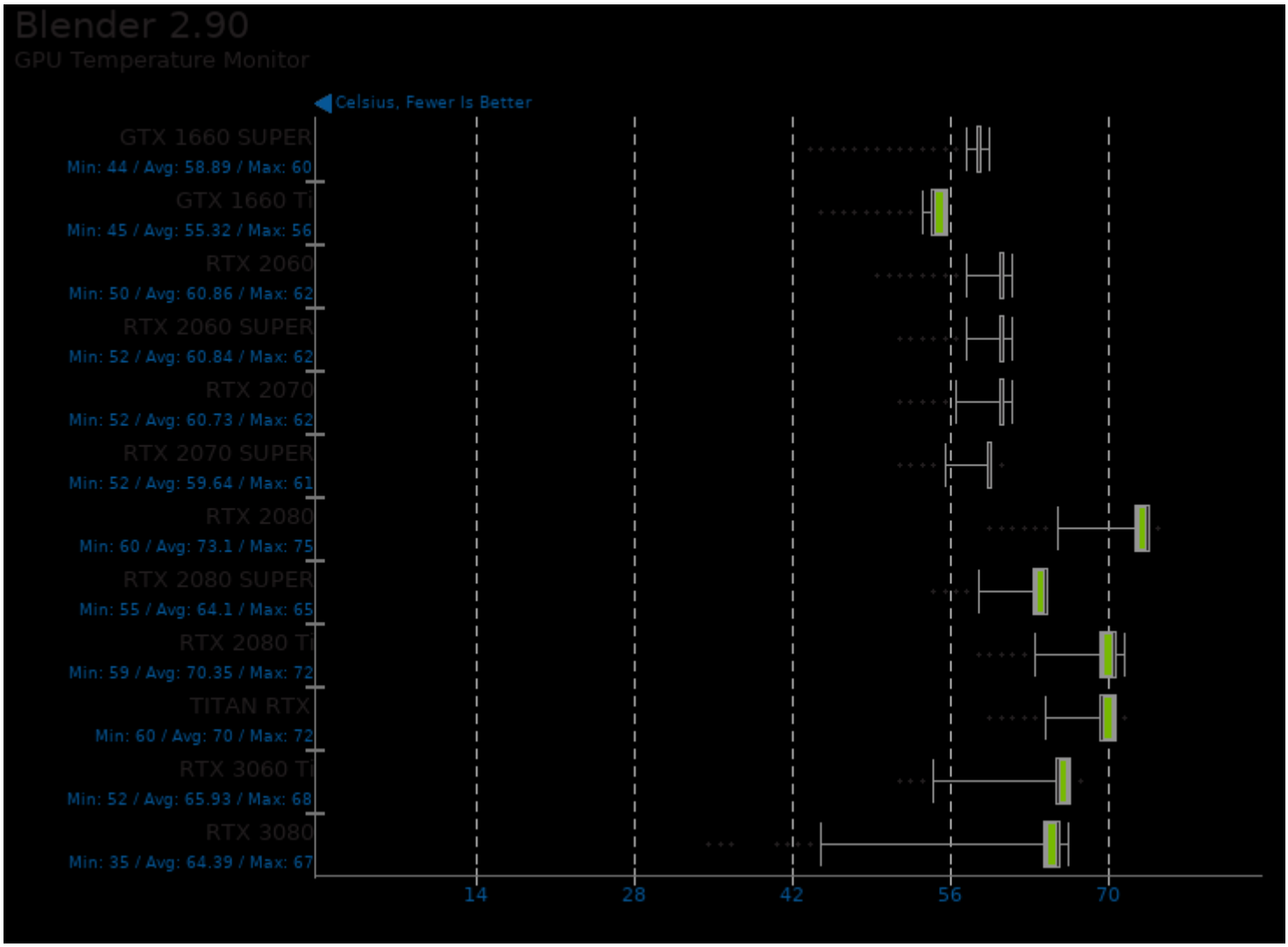
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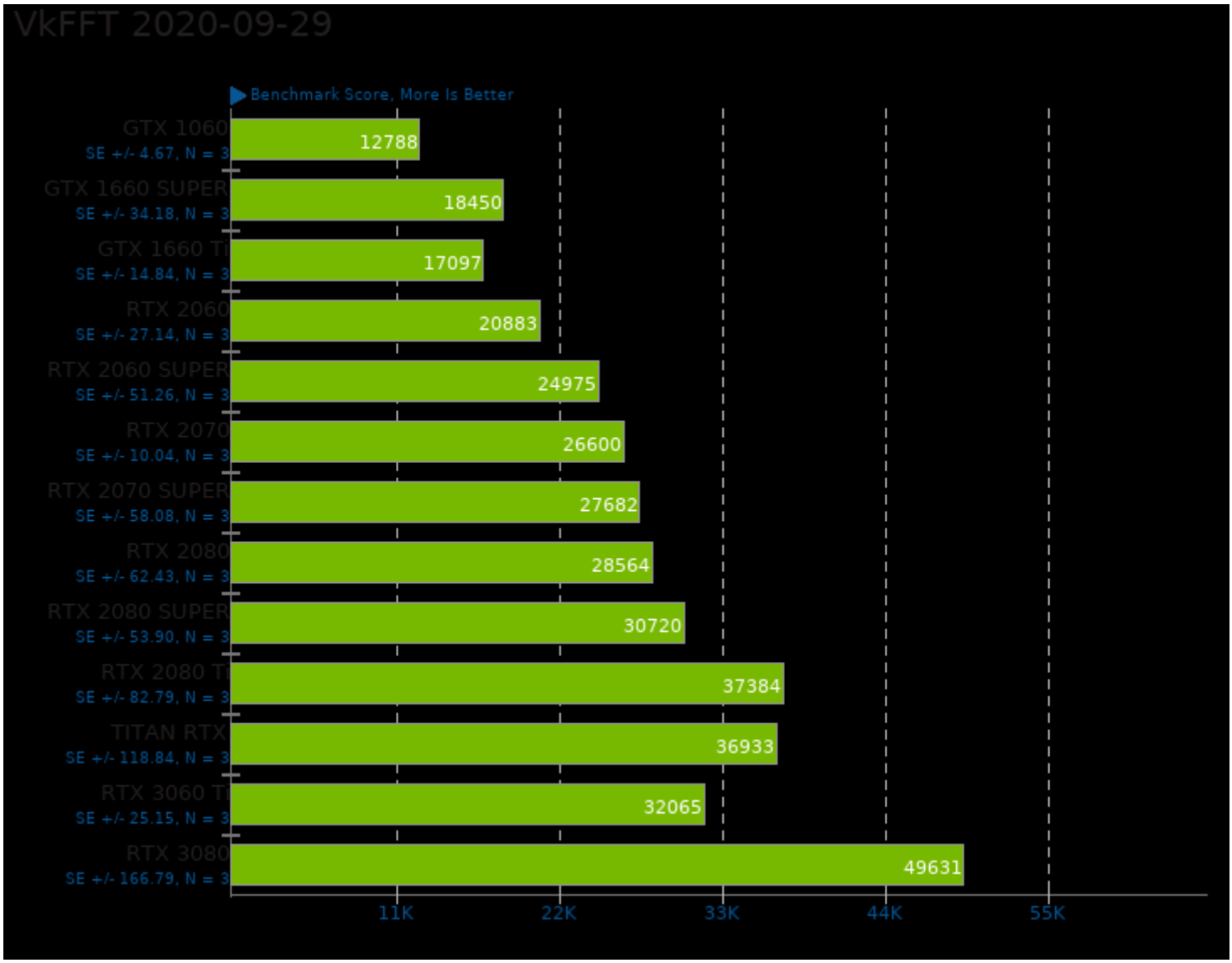
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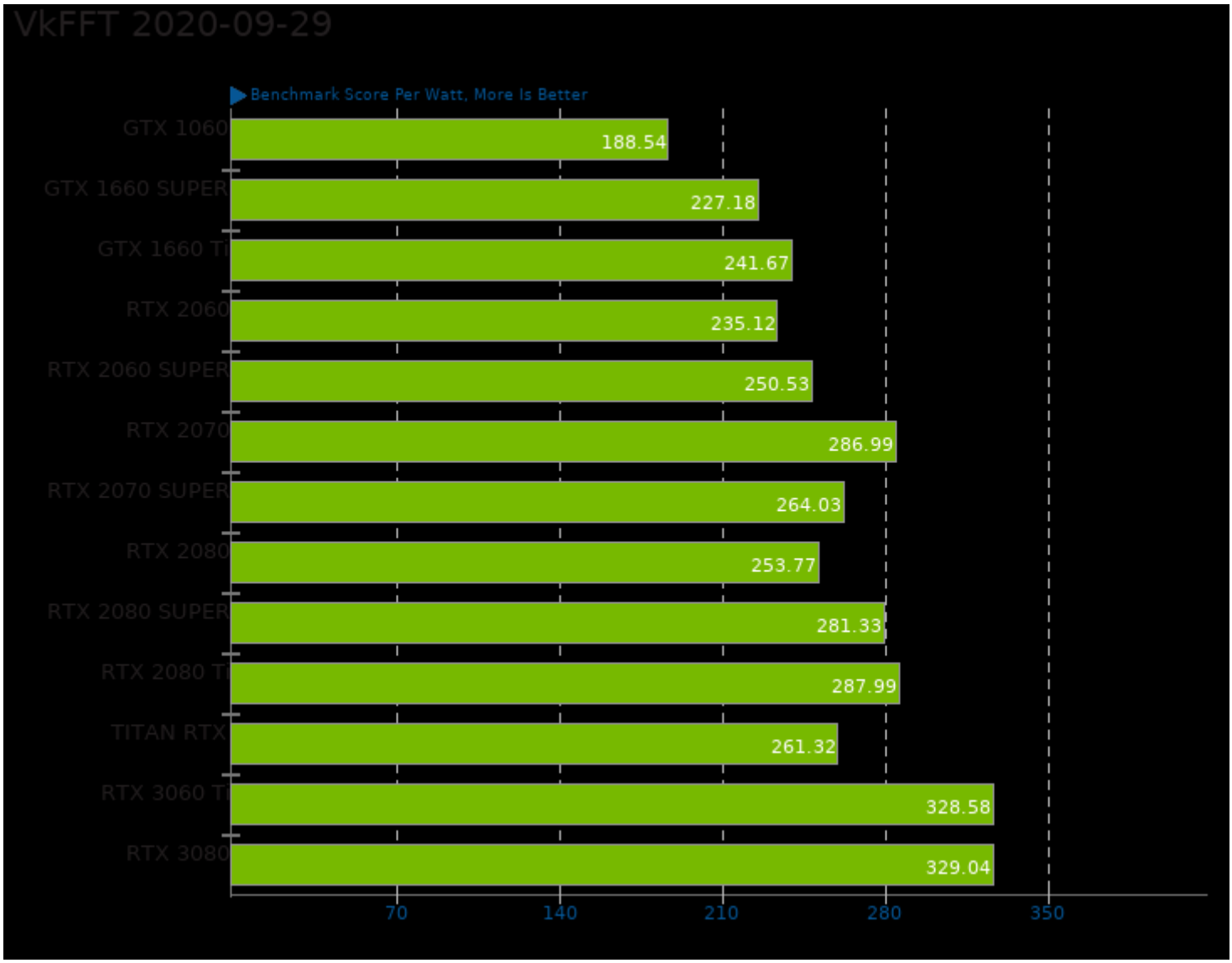
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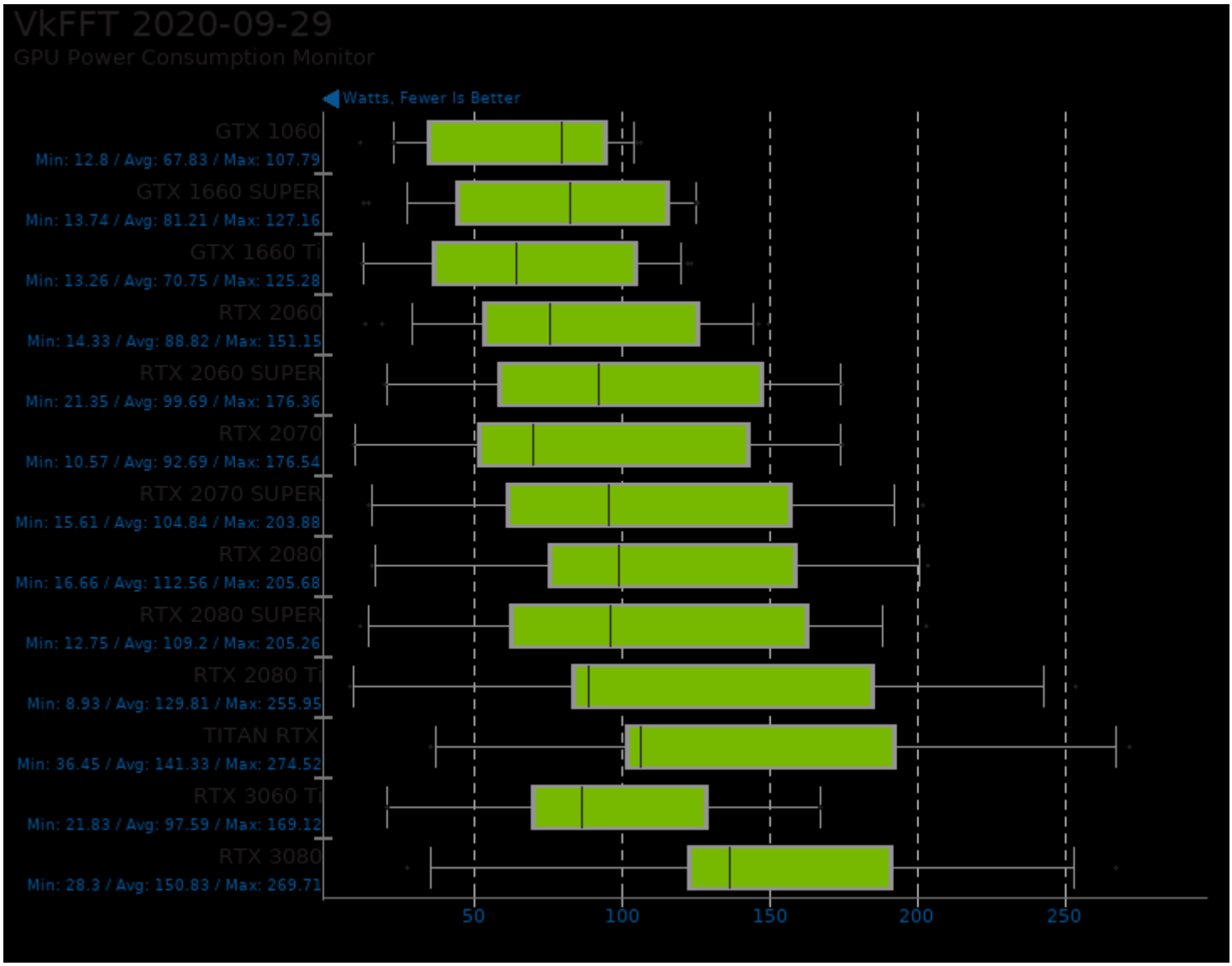
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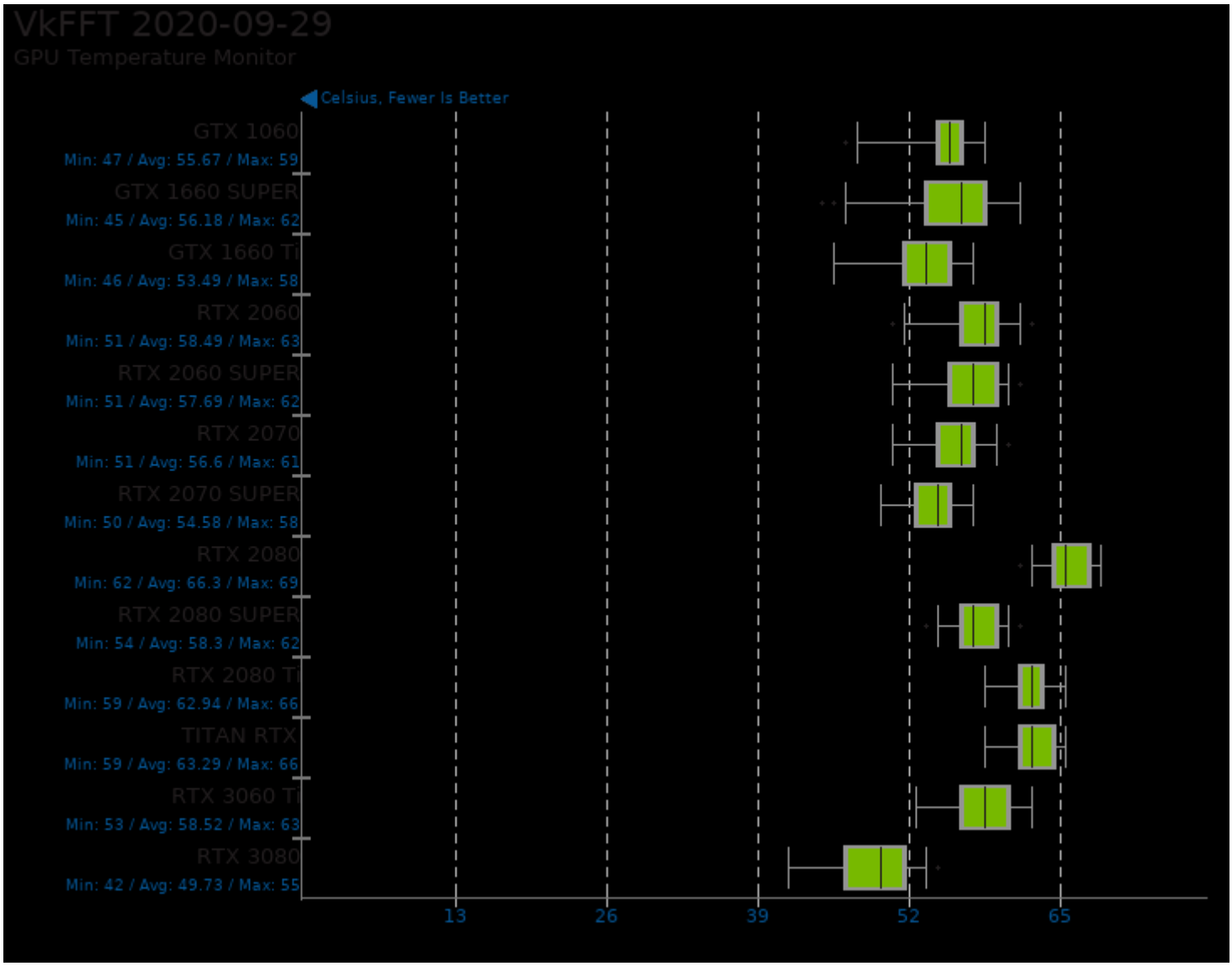
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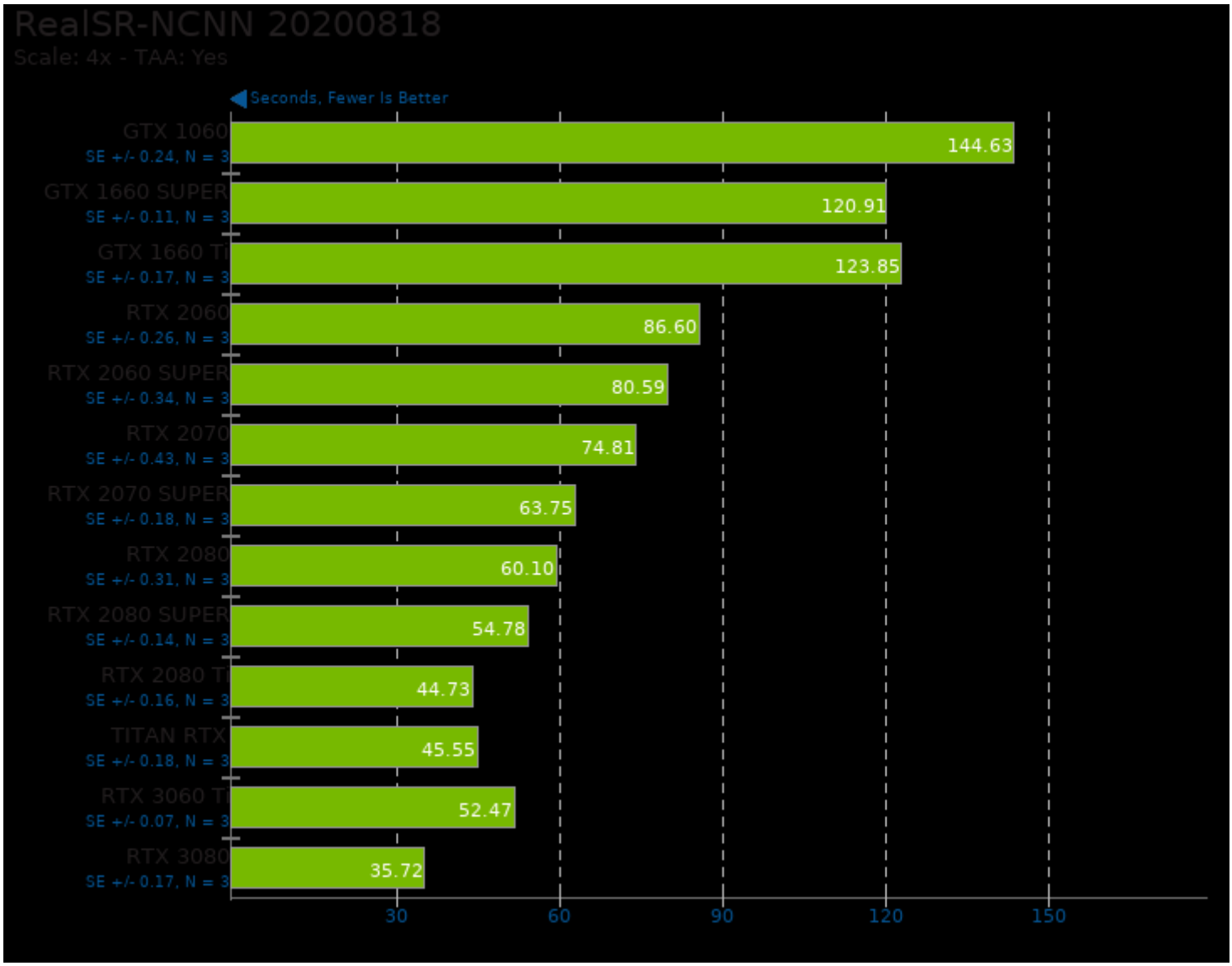
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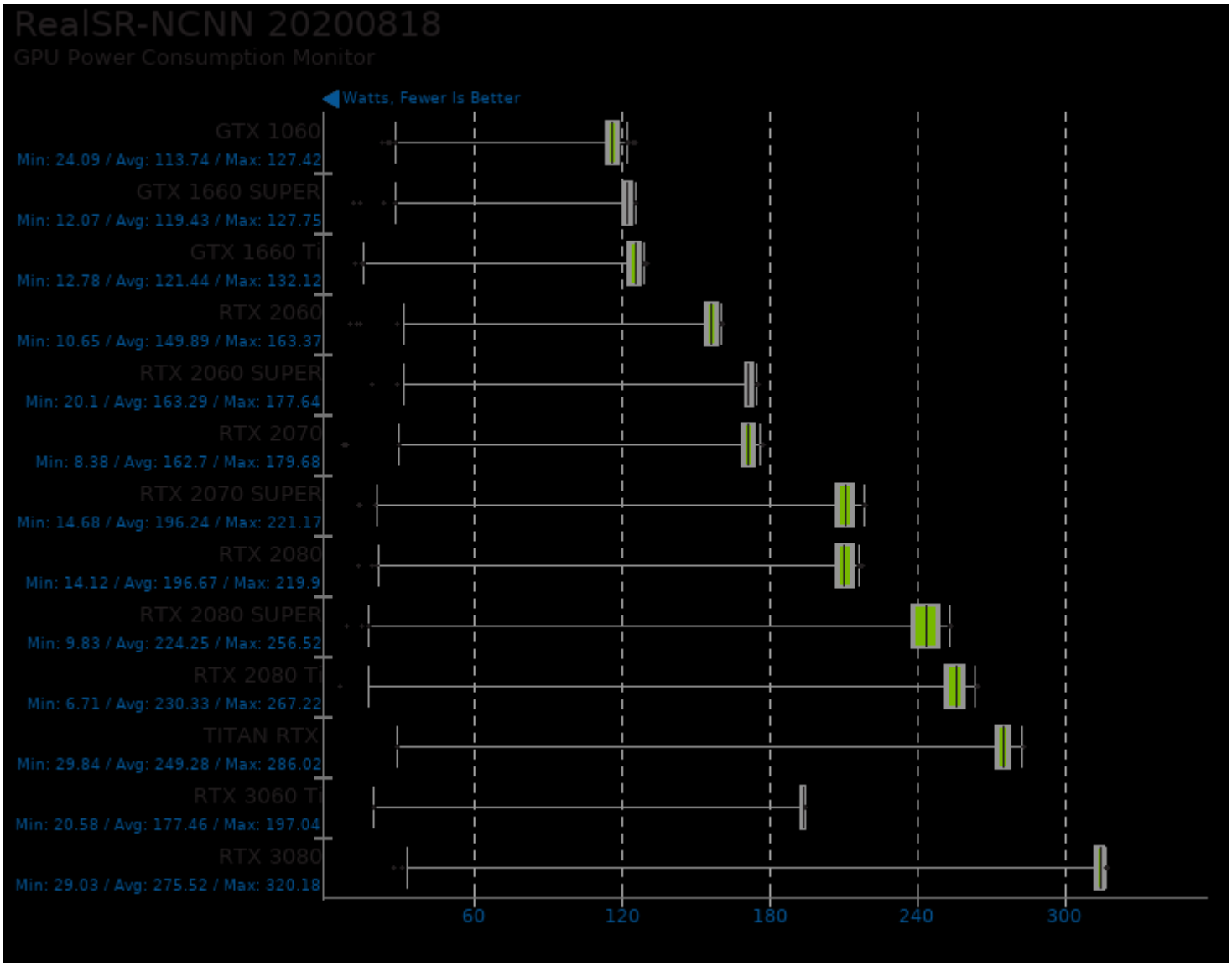
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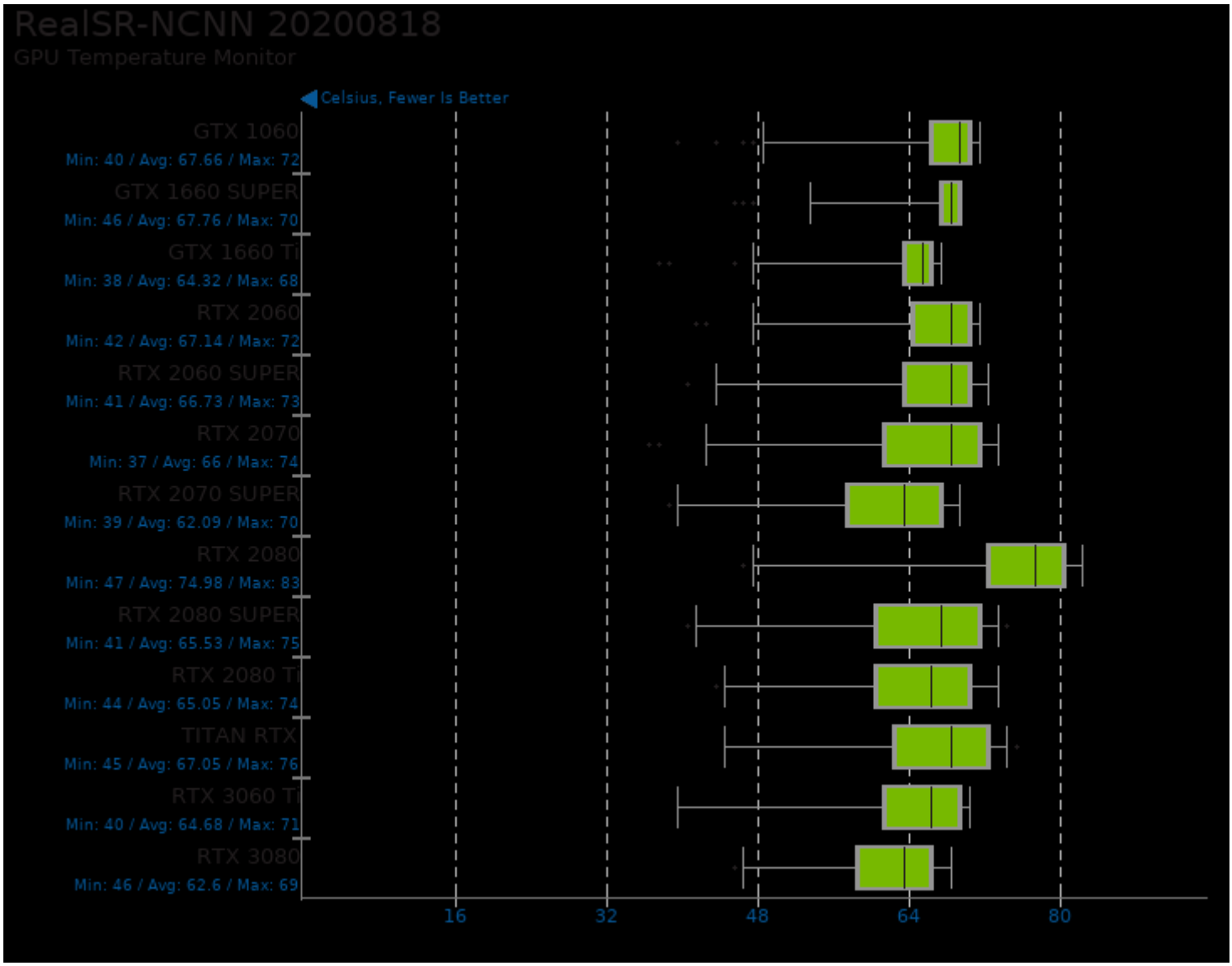


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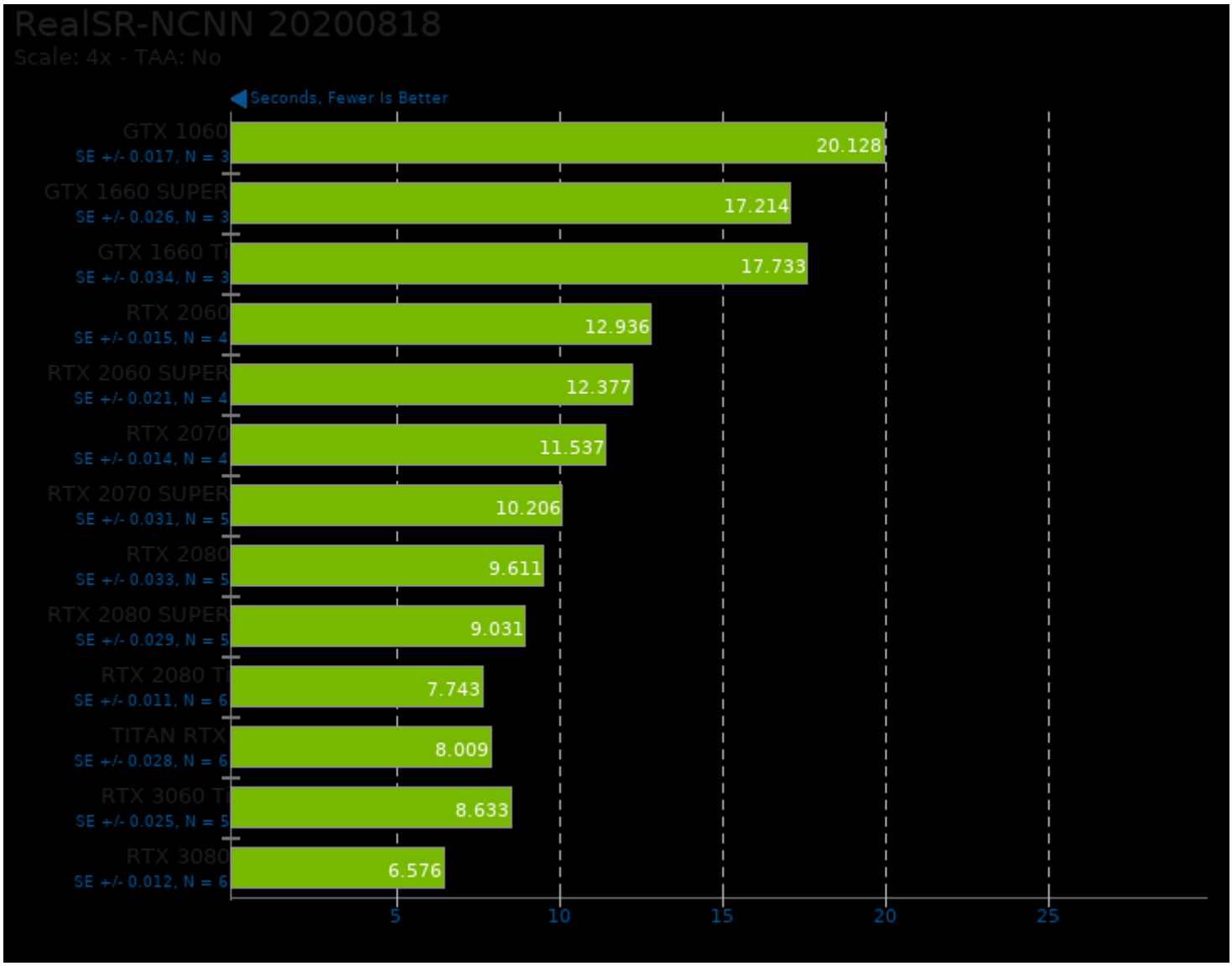


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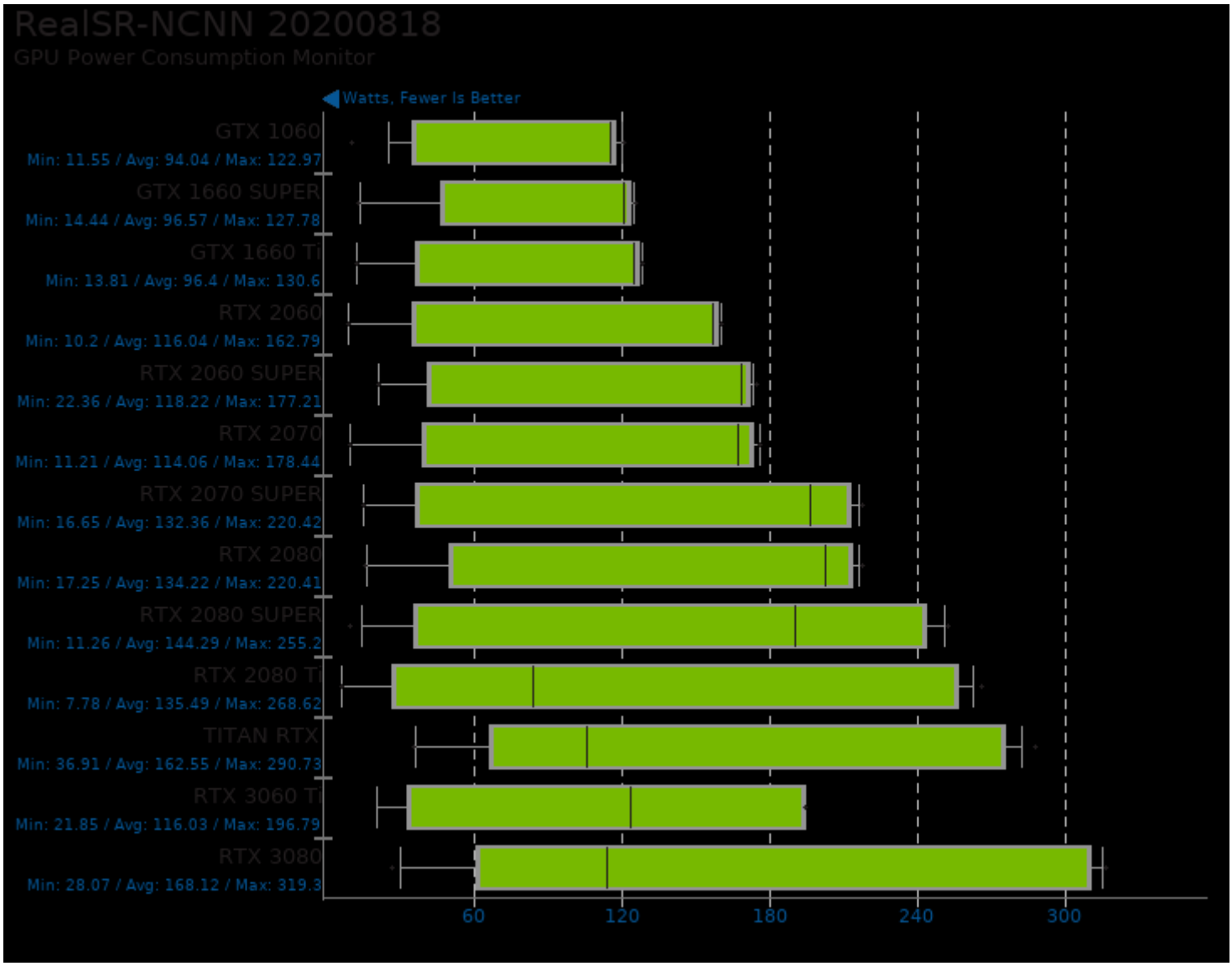



RealSR-NCNN 20200818
GPU Temperature Monitor
Celsius, Fewer Is Better
GTX 1060
Min: 40 / Avg: 67.66 / Max: 72
GTX 1660 SUPER
Min: 46 / Avg: 67.76 / Max: 70
GTX 1660 Ti
Min: 38 / Avg: 64.32 / Max: 68
RTX 2060
Min: 42 / Avg: 67.14 / Max: 72
RTX 2060 SUPER
Min: 41 / Avg: 66.73 / Max: 73
RTX 2070
Min: 37 / Avg: 66 / Max: 74
RTX 2070 SUPER
Min: 39 / Avg: 62.09 / Max: 70
RTX 2080
Min: 47 / Avg: 74.98 / Max: 83
RTX 2080 SUPER
Min: 41 / Avg: 65.53 / Max: 75
RTX 2080 Ti
Min: 44 / Avg: 65.05 / Max: 74
TITAN RTX
Min: 45 / Avg: 67.05 / Max: 76
RTX 3060 Ti
Min: 40 / Avg: 64.68 / Max: 71
RTX 3080
Min: 46 / Avg: 62.6 / Max: 69
16
32
48
64
80

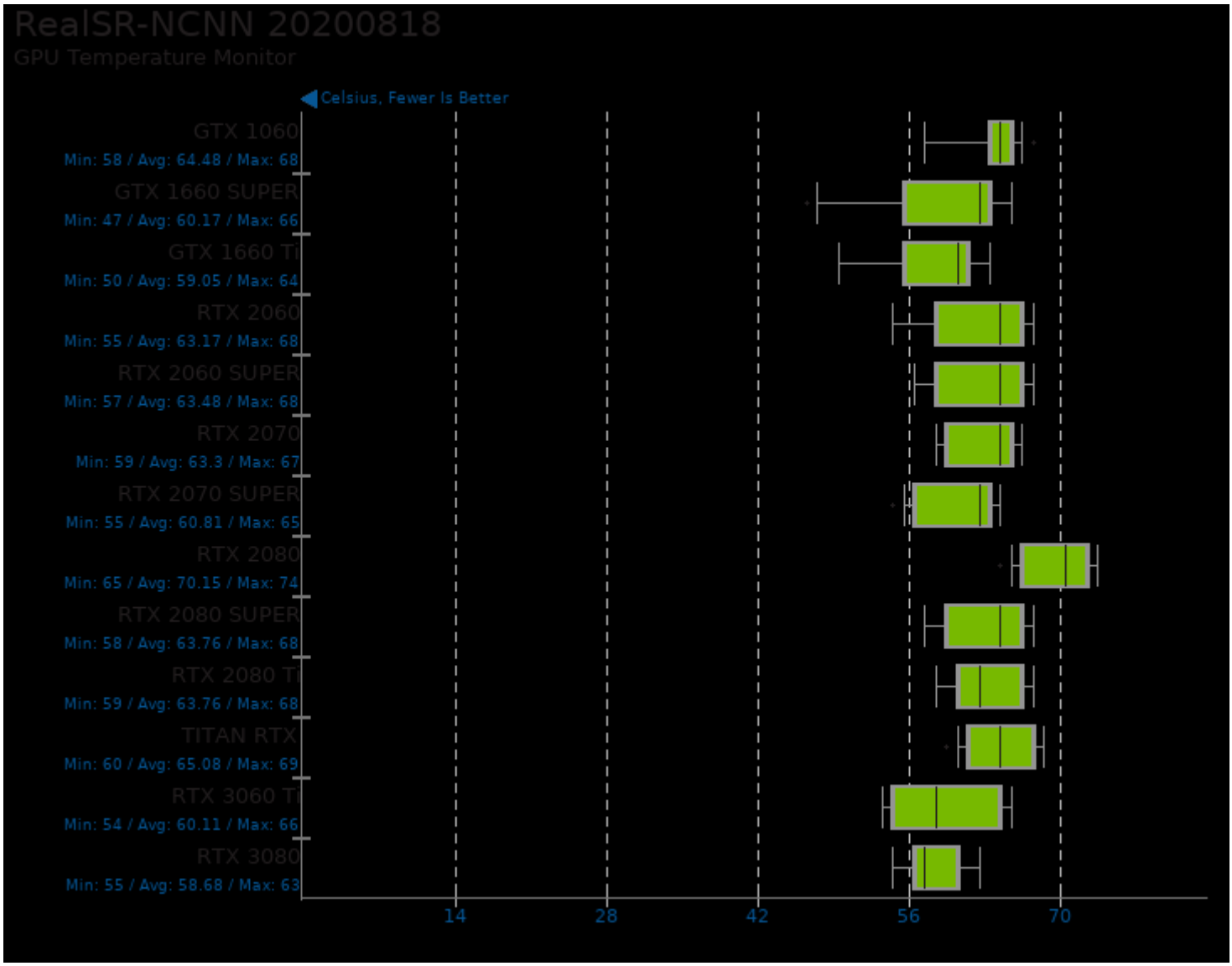
NVIDIA Compute Comparison



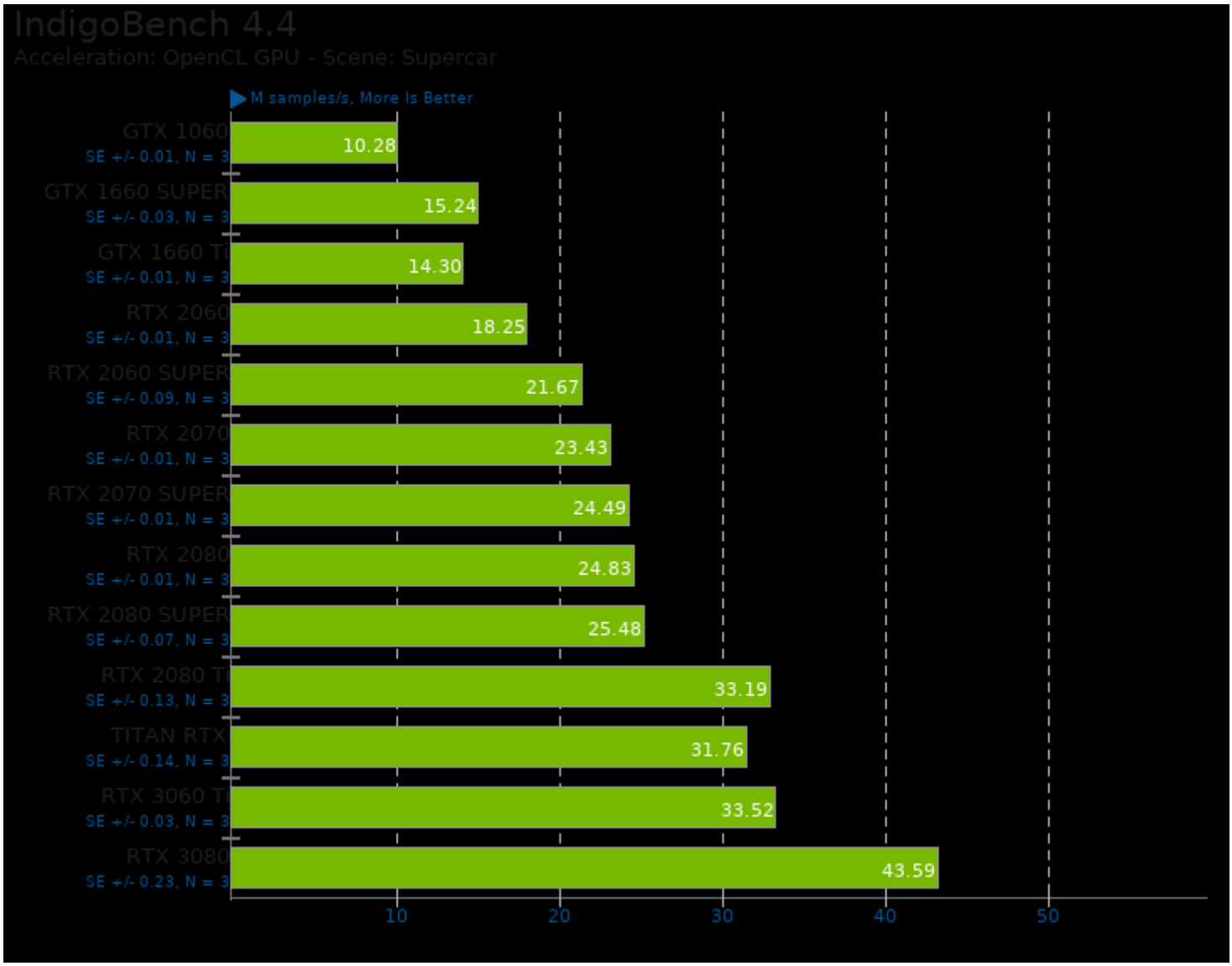
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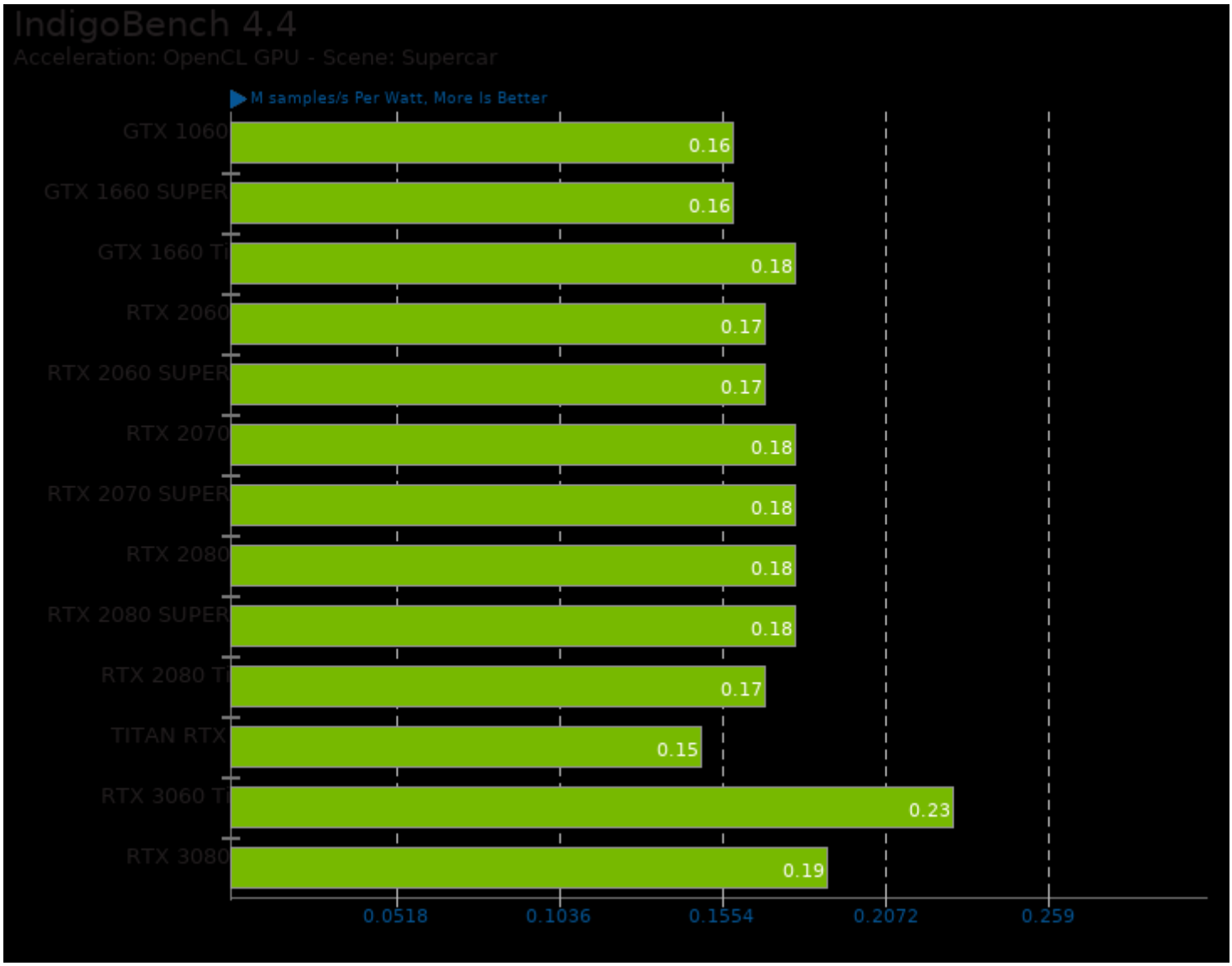
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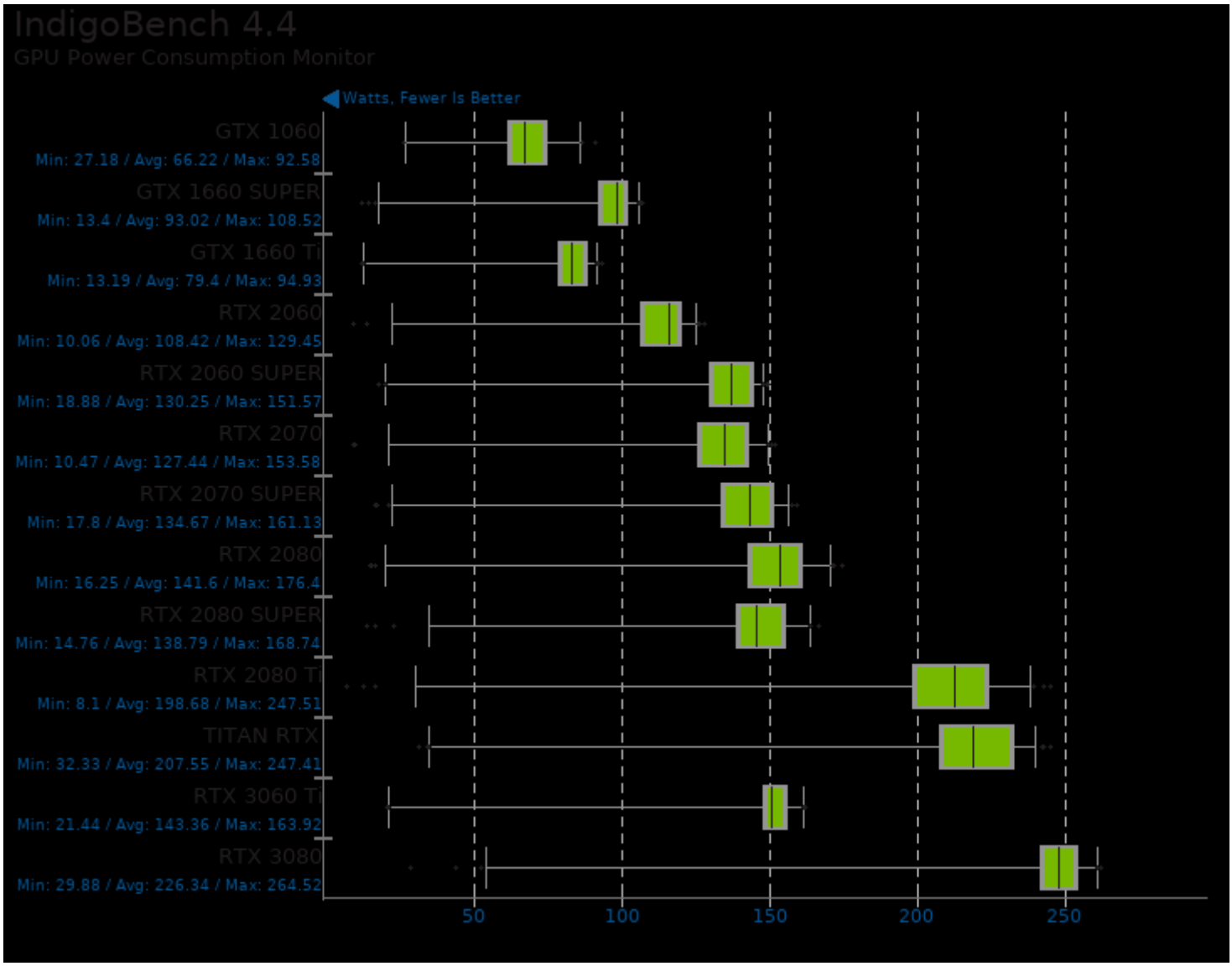
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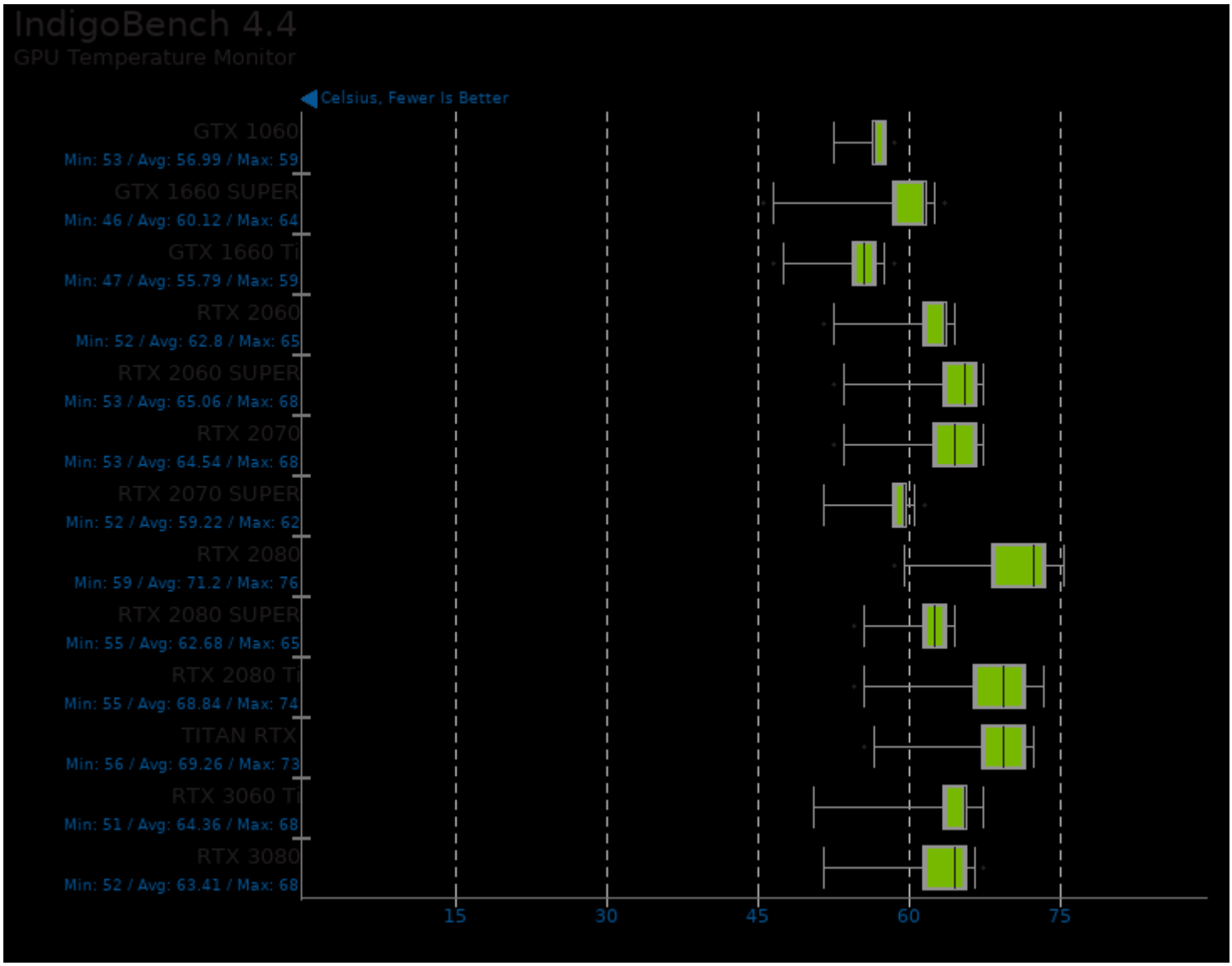
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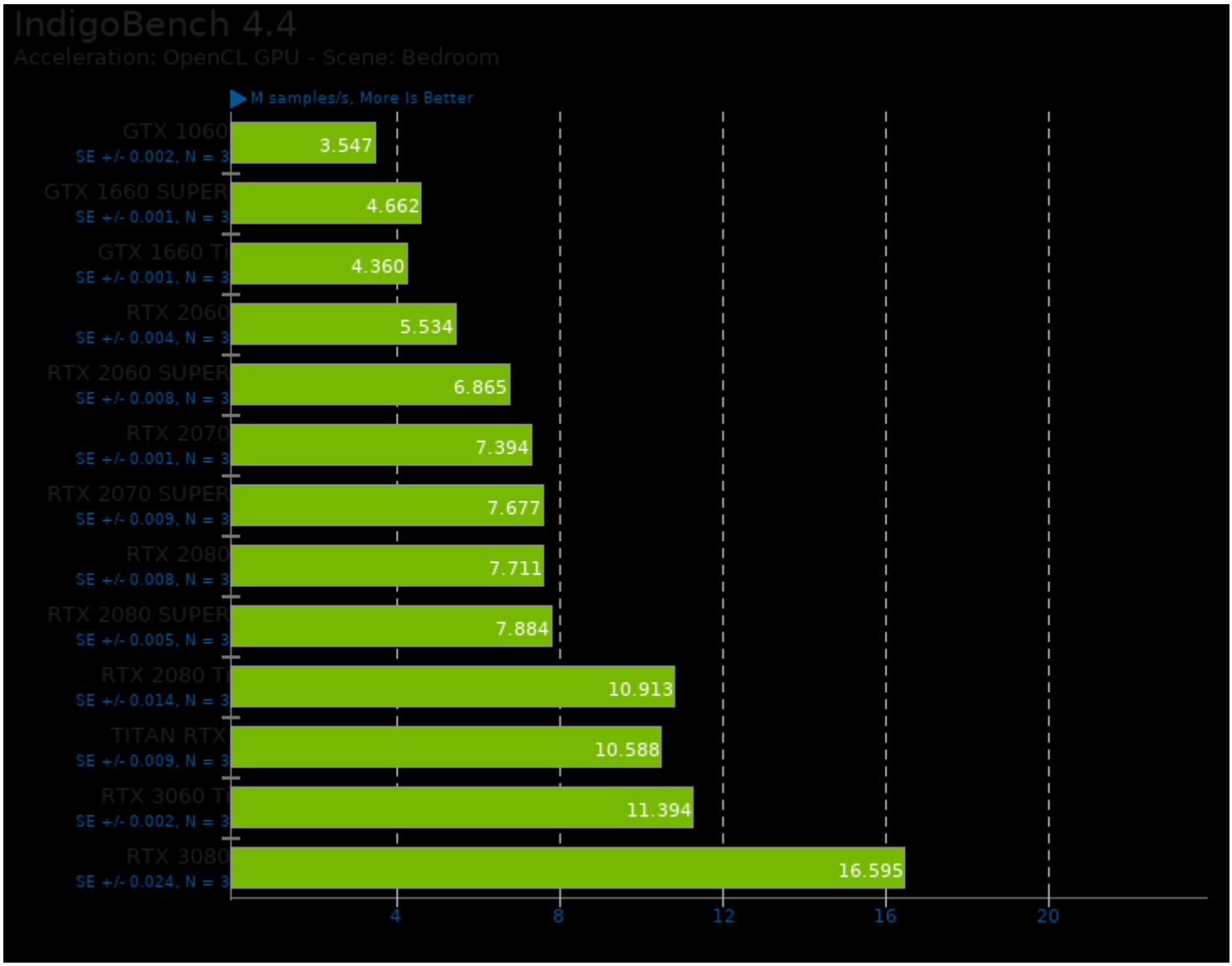
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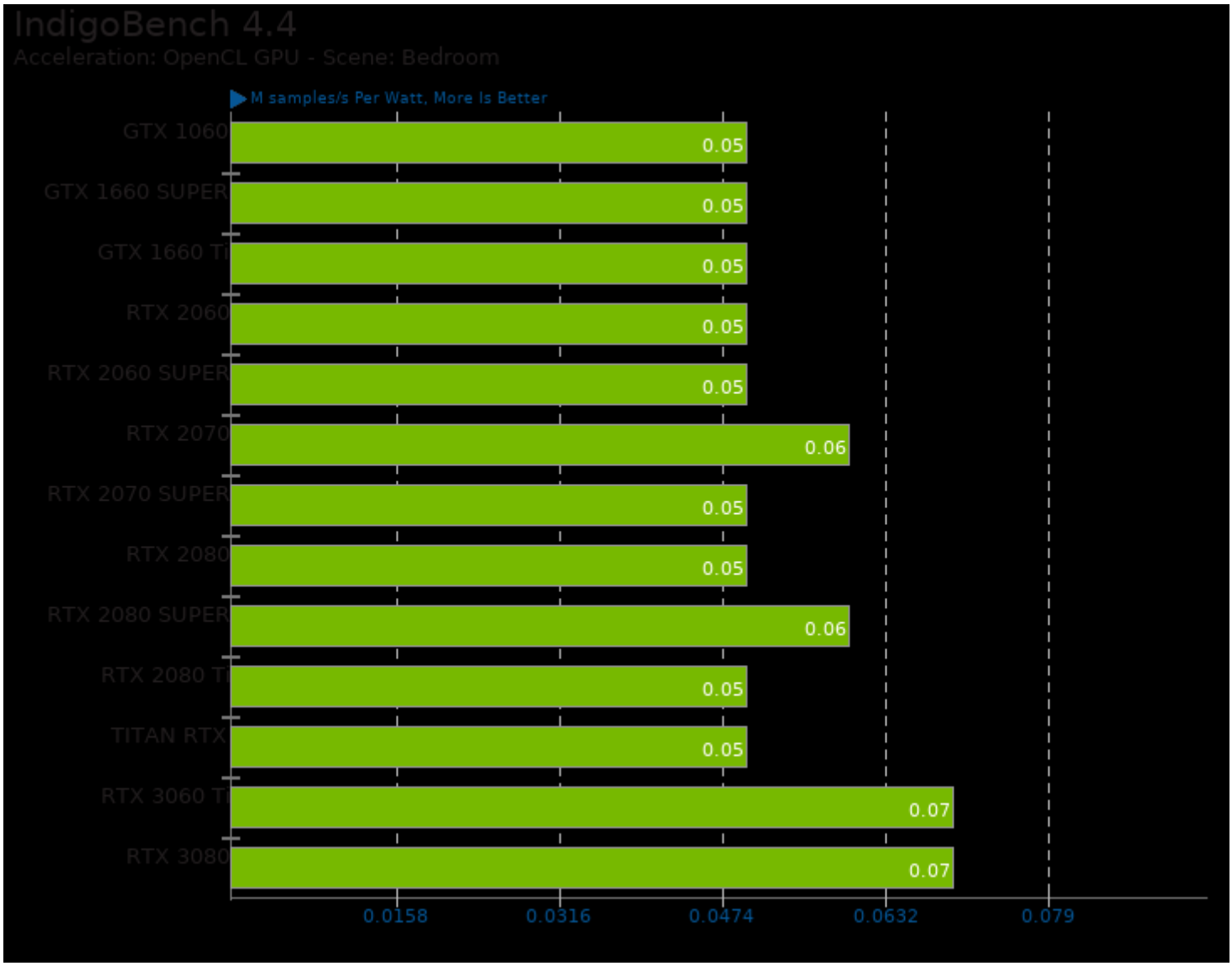
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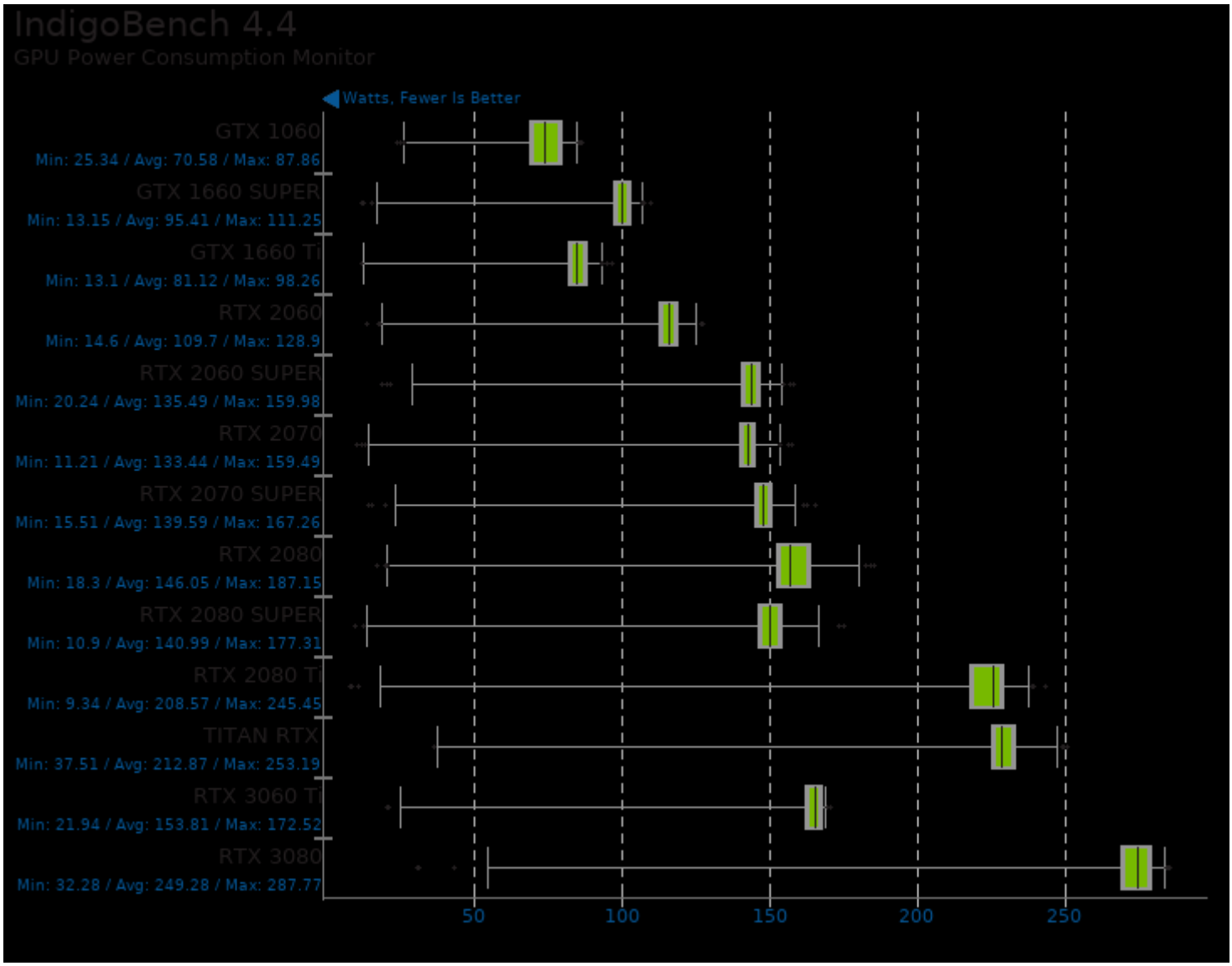
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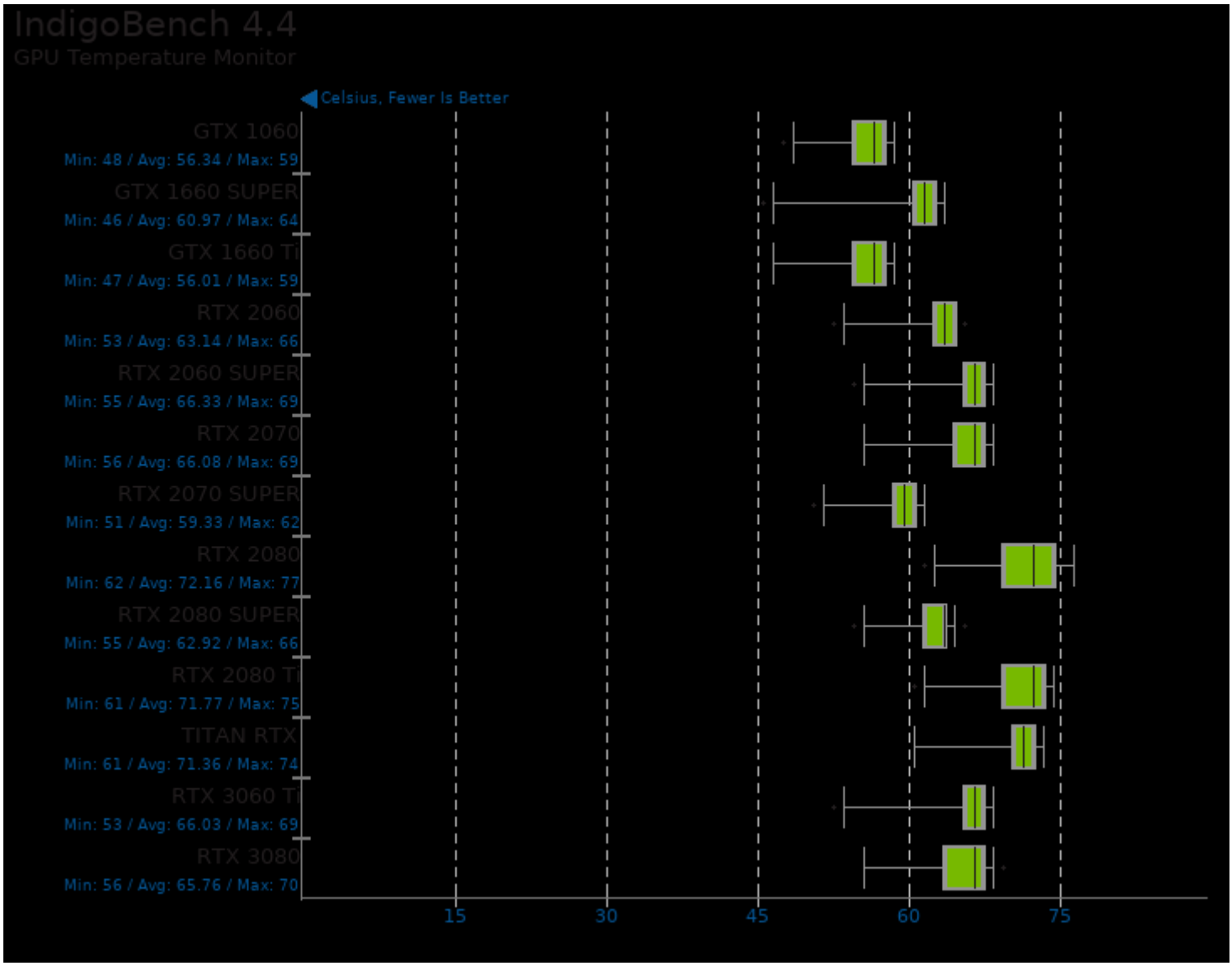
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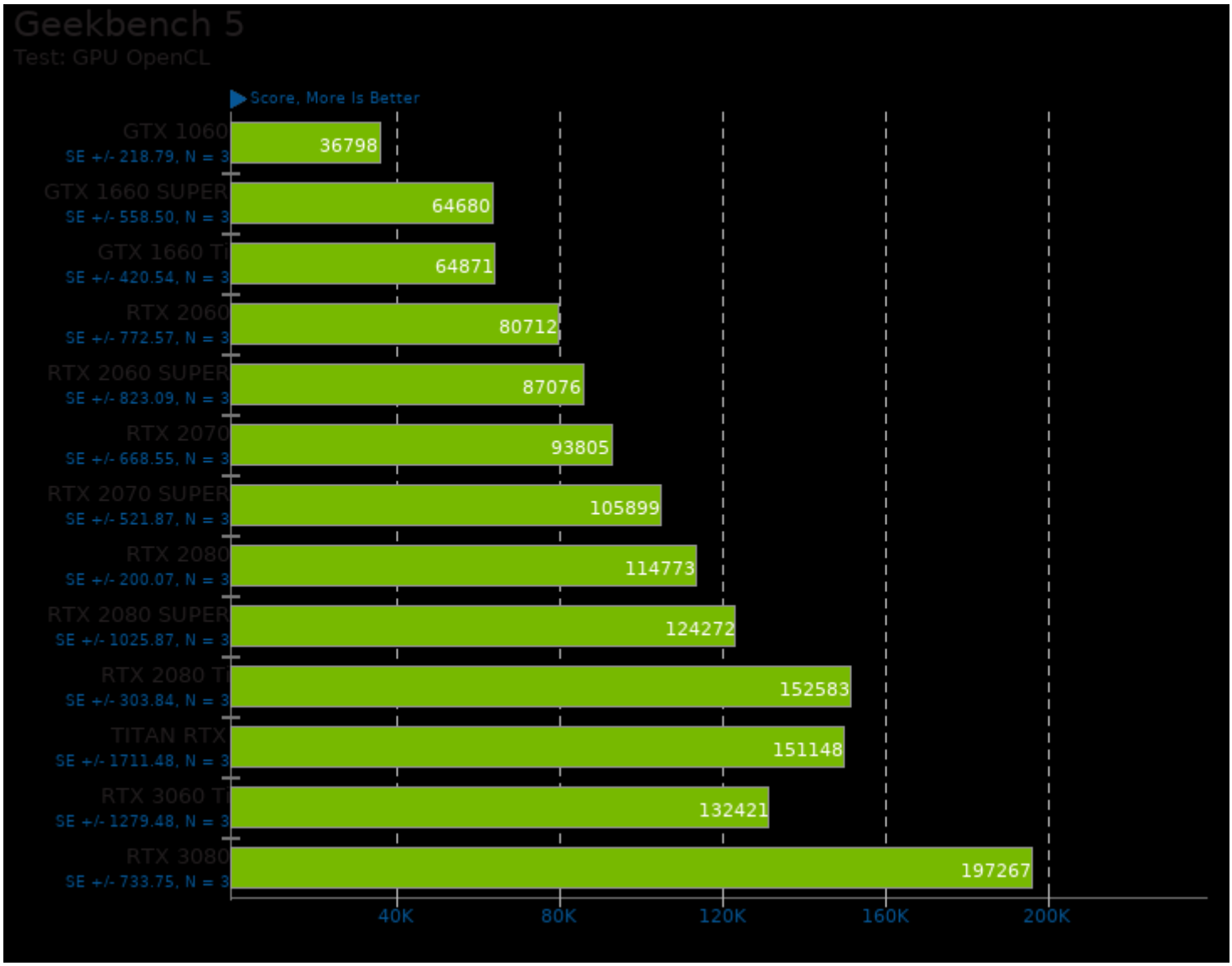
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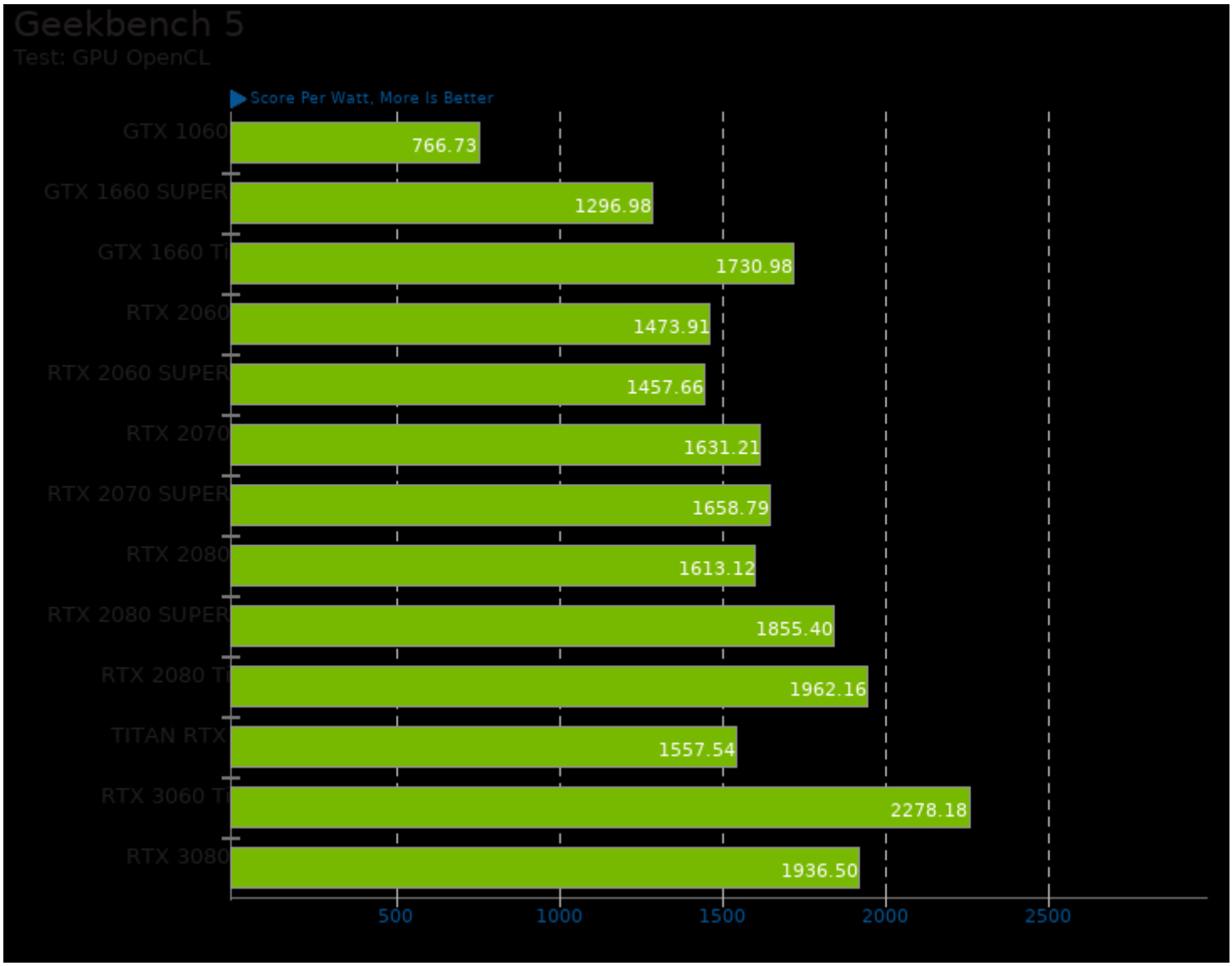
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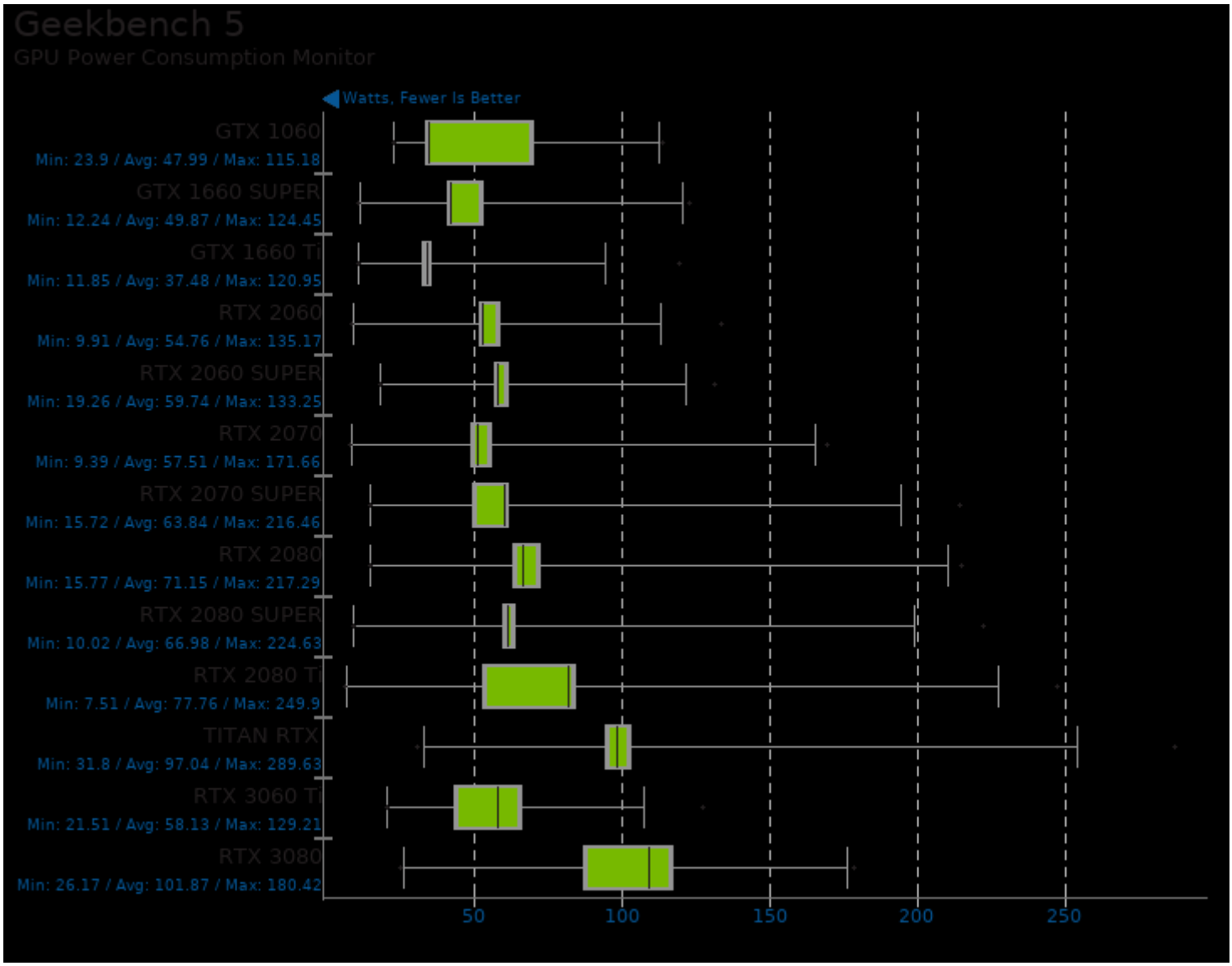
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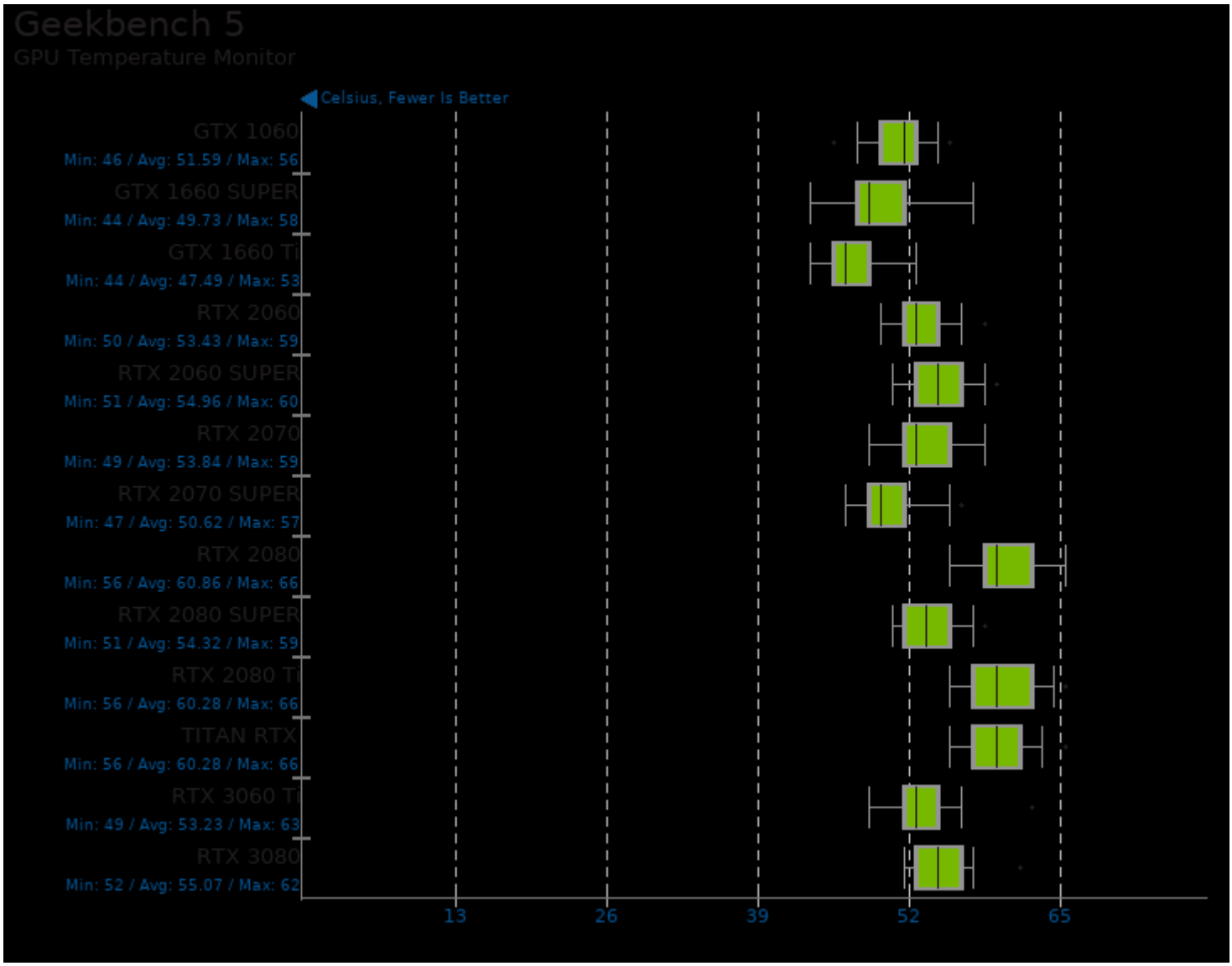
NVIDIA Compute Comparison



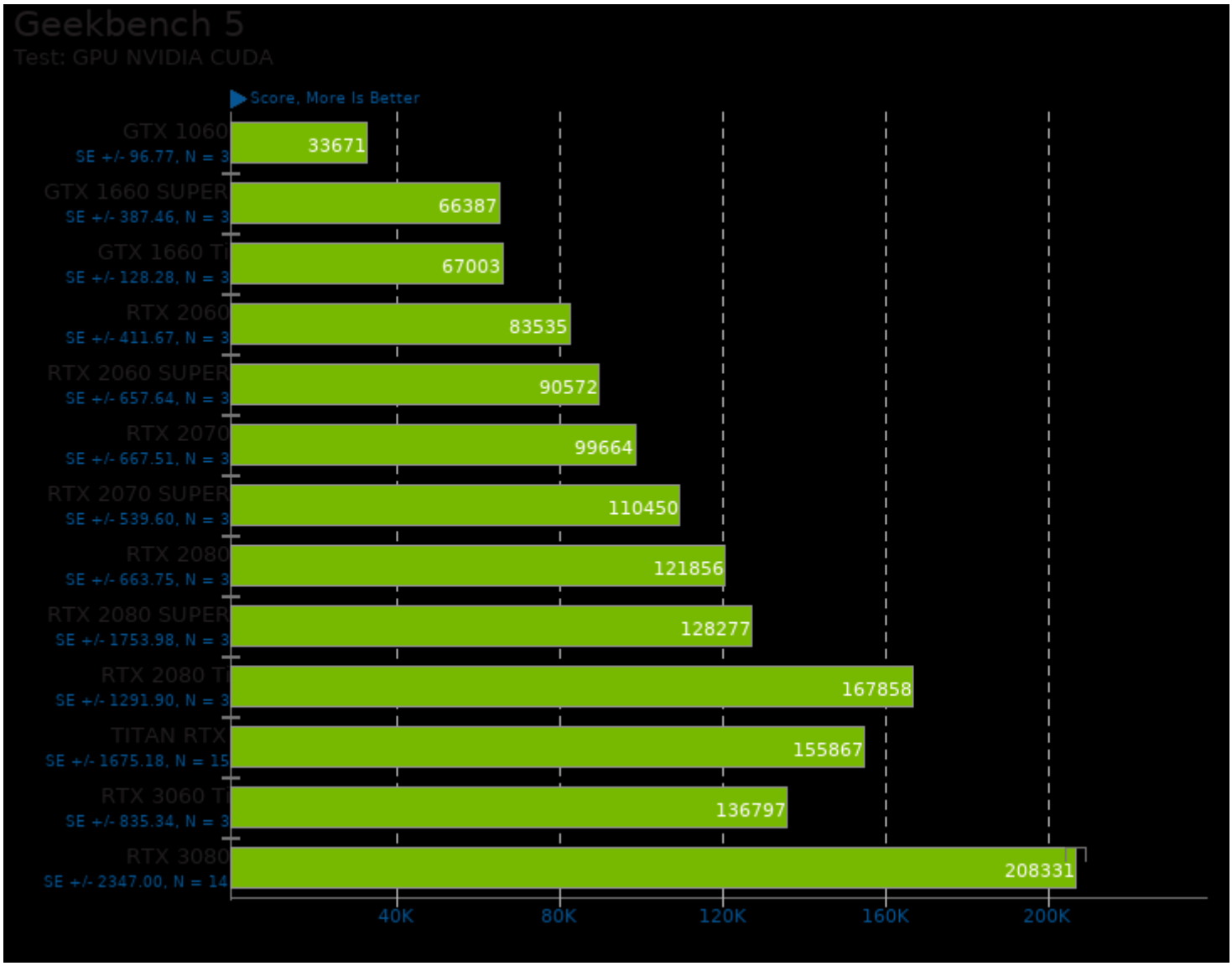
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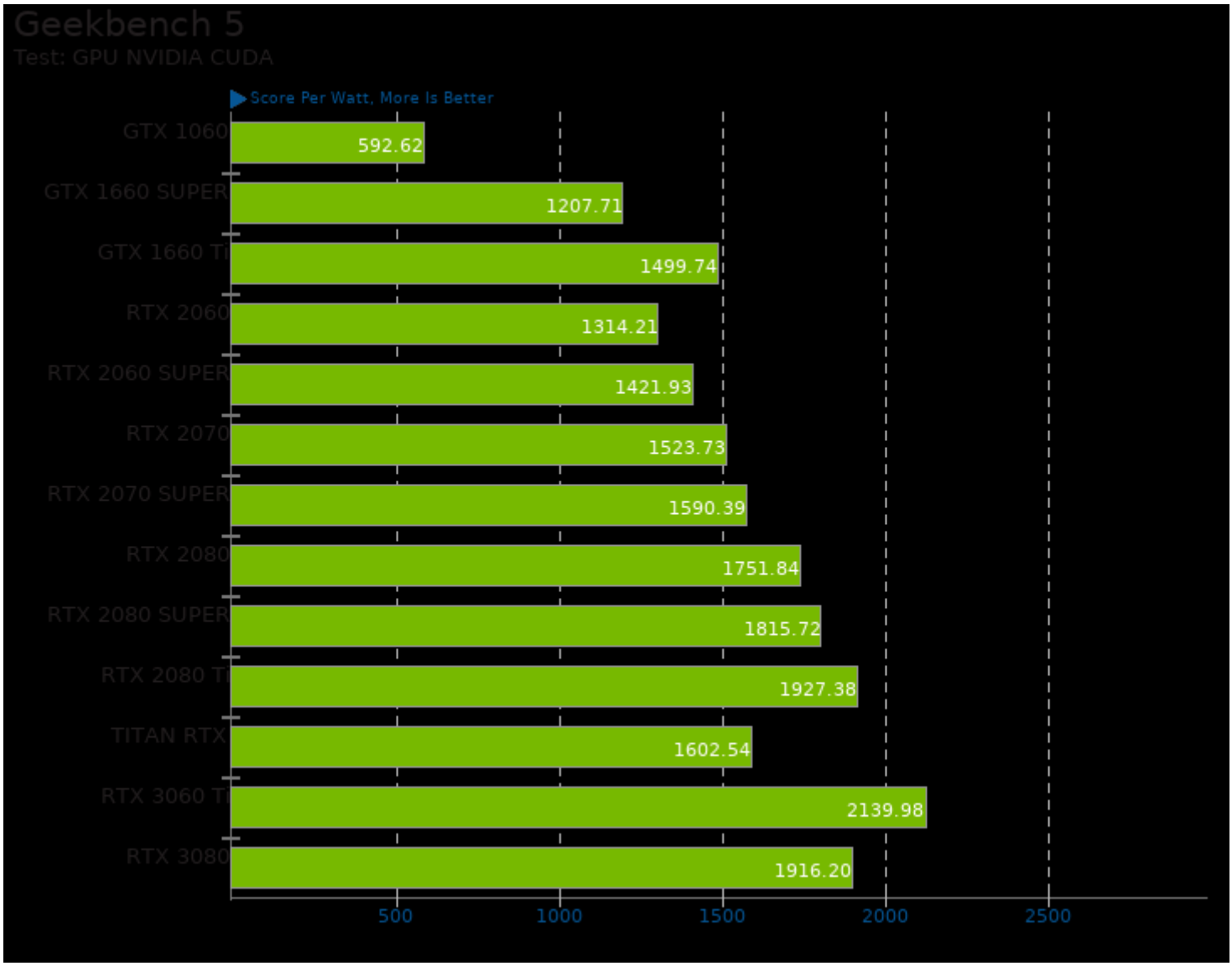
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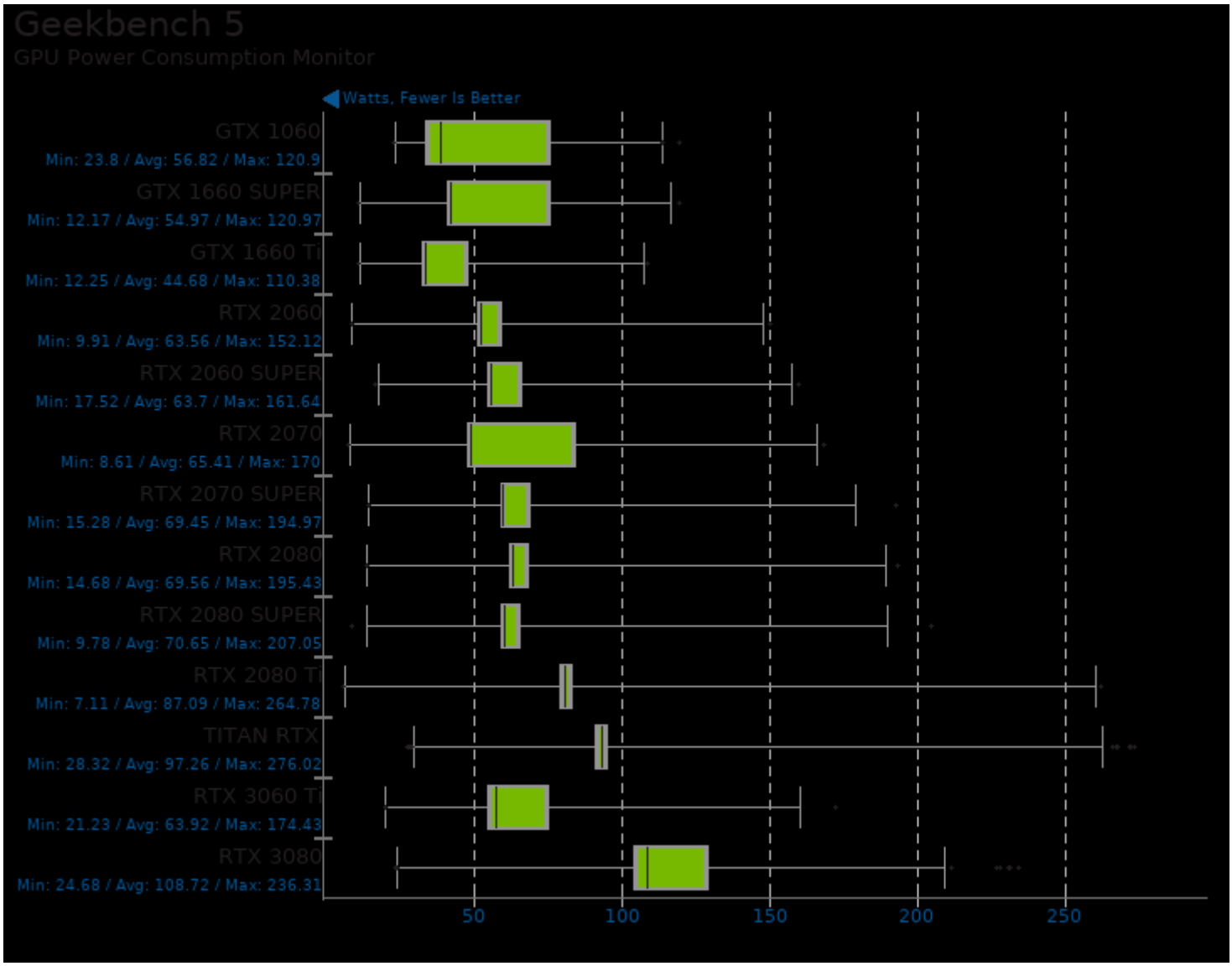
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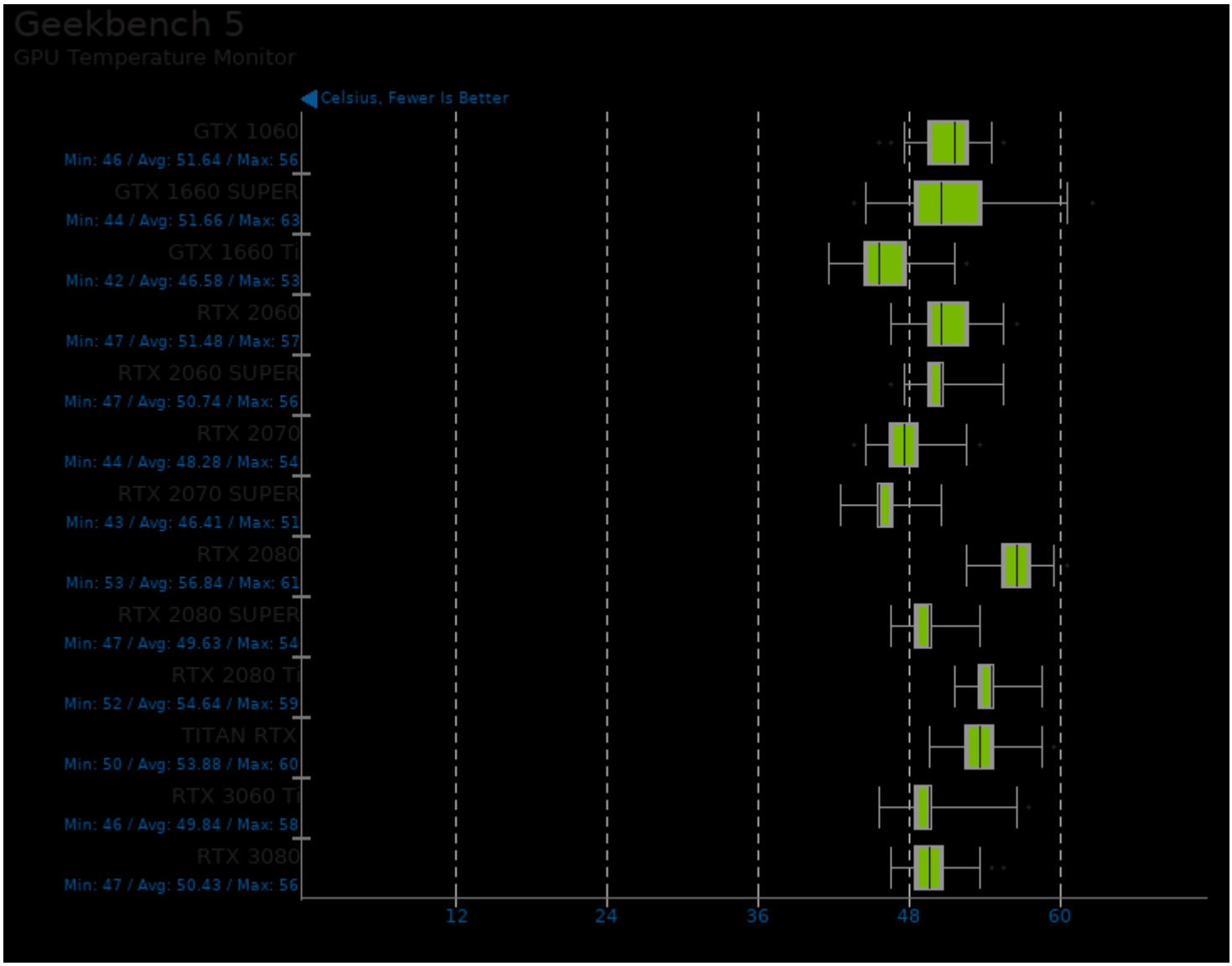
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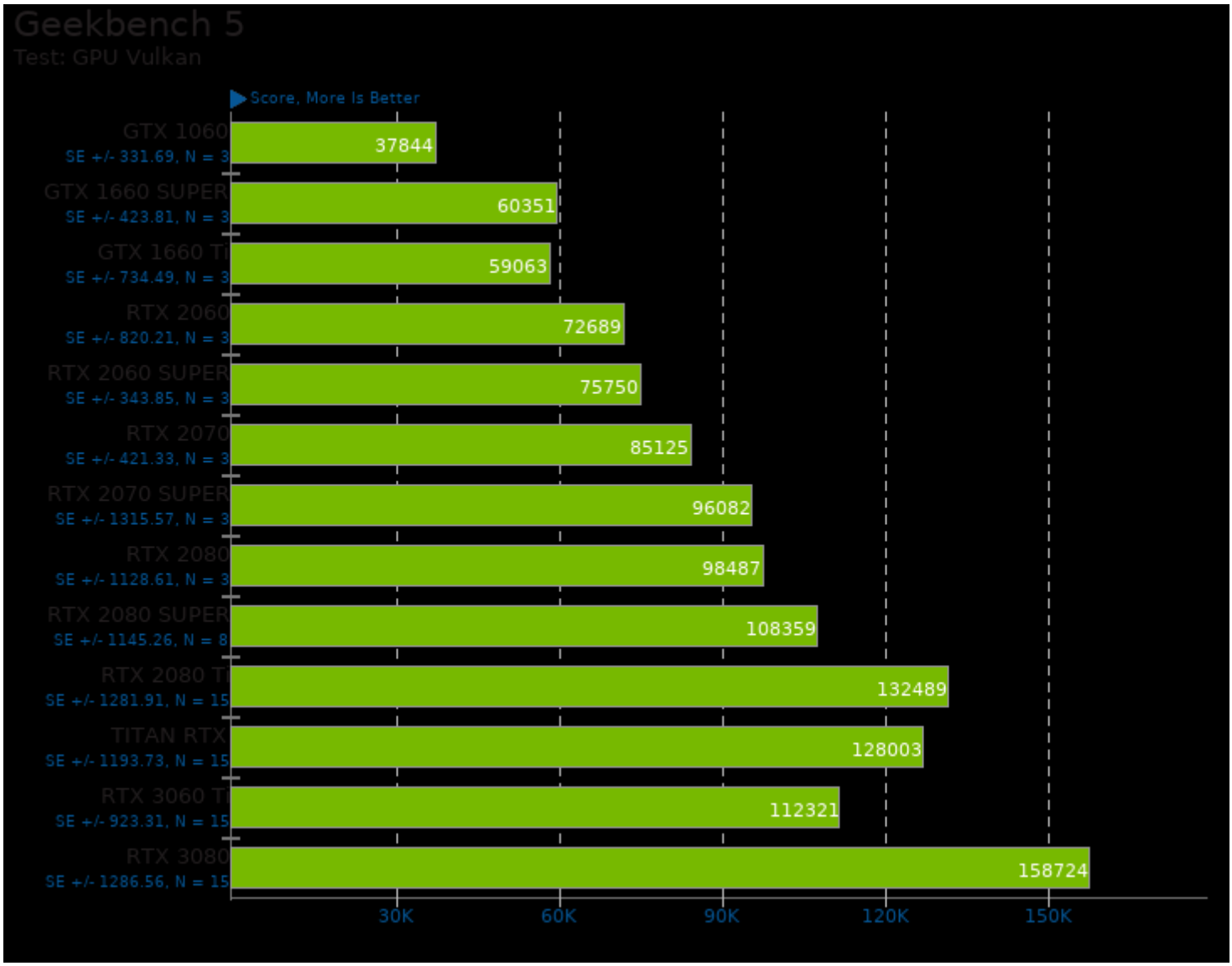
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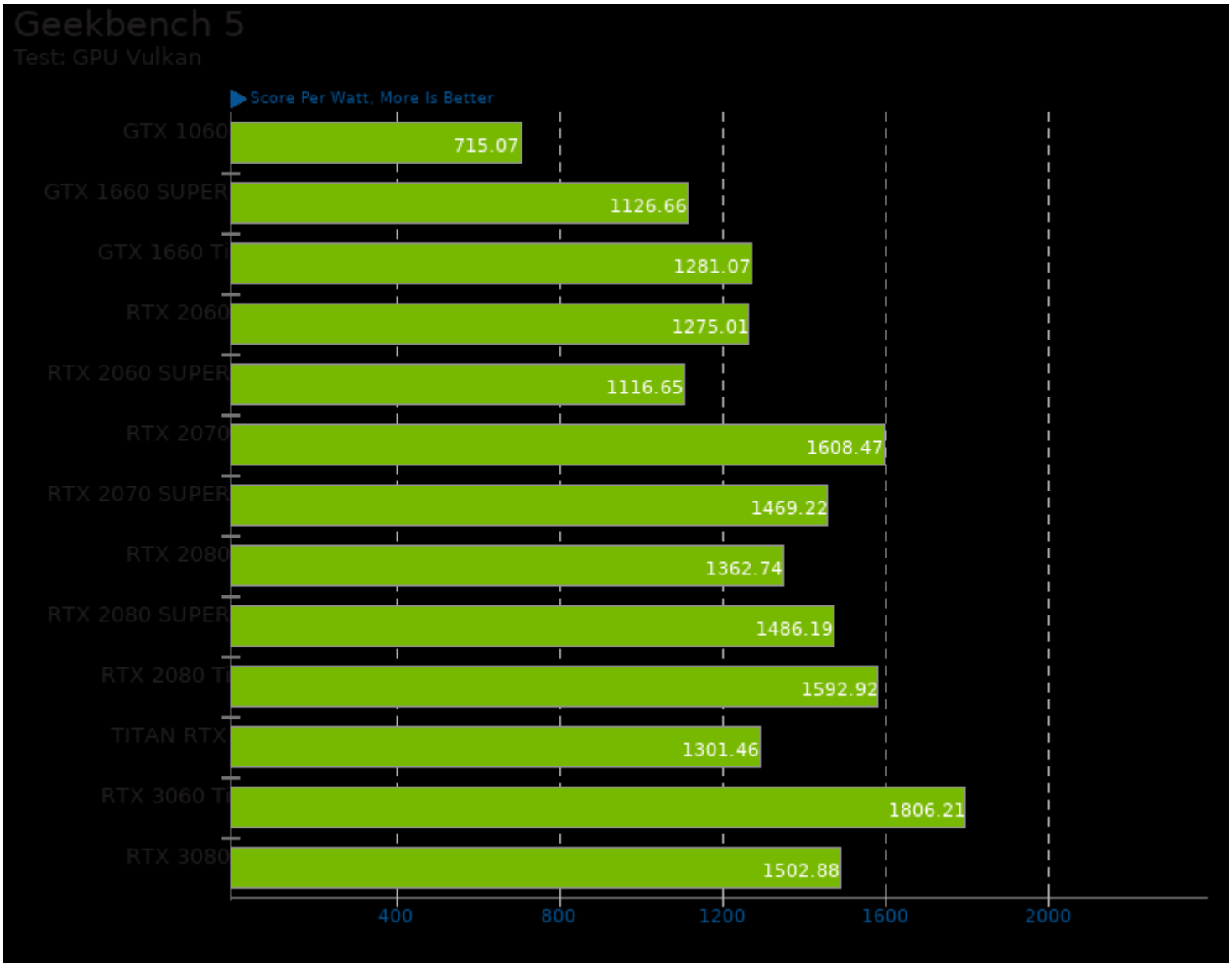
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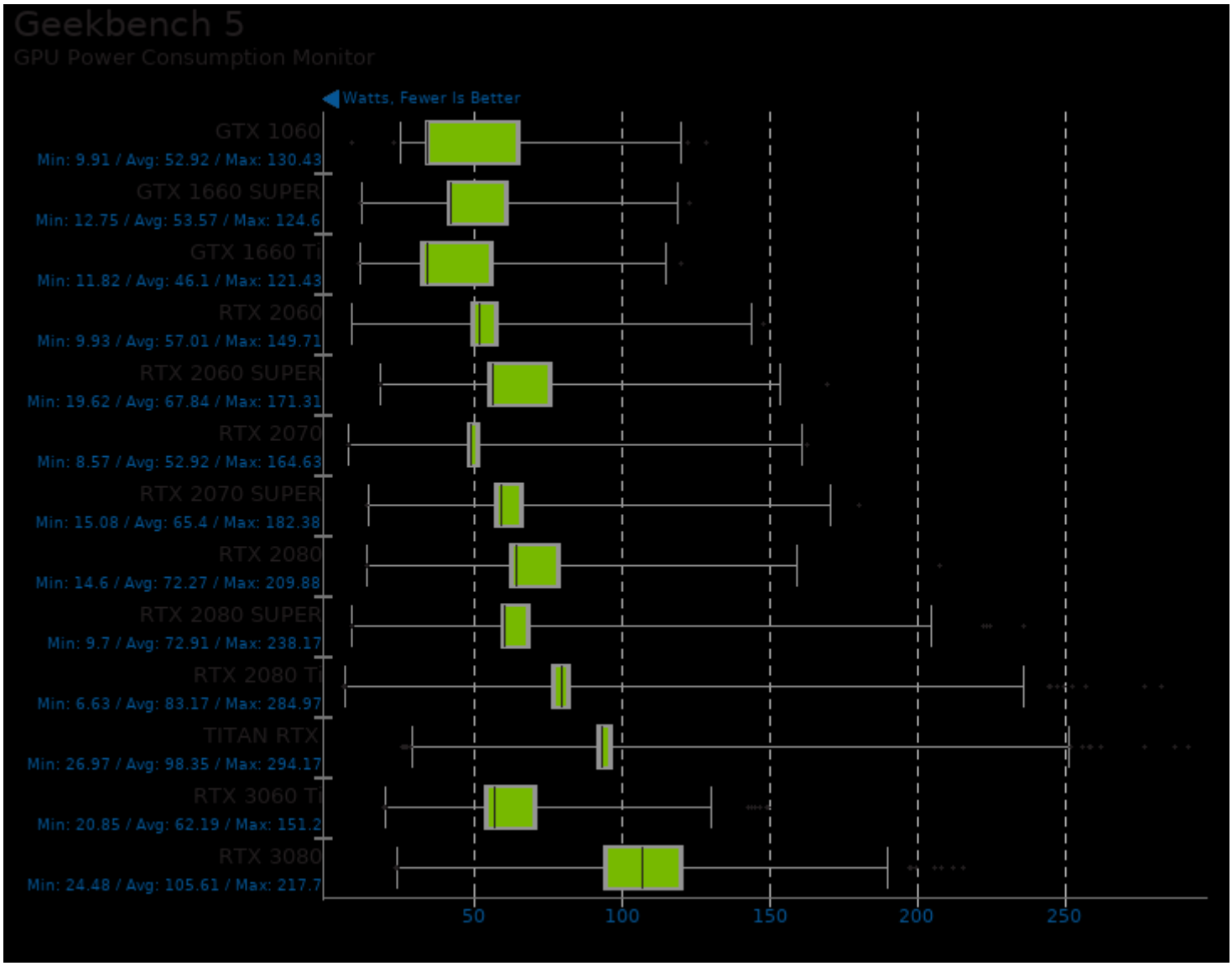
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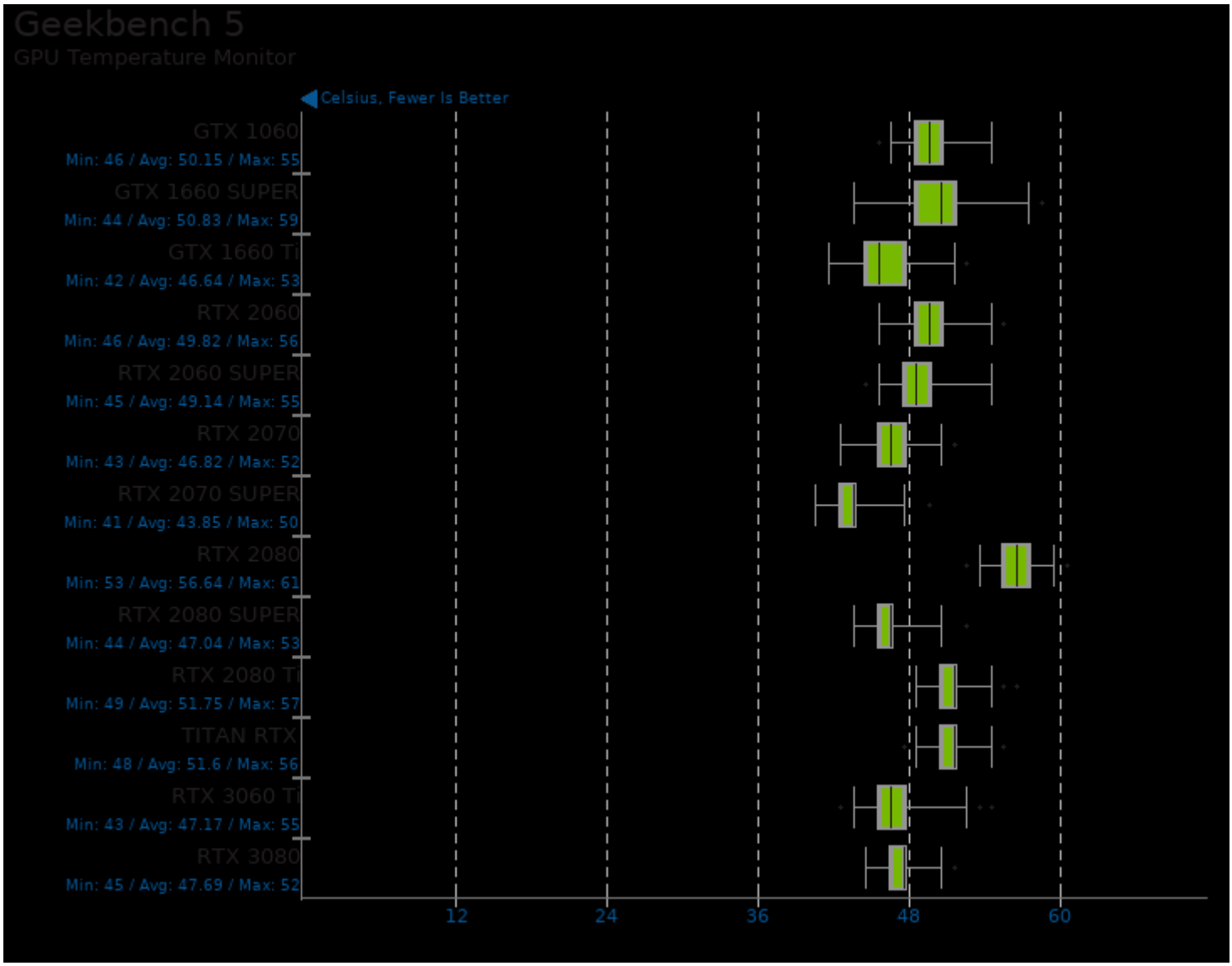
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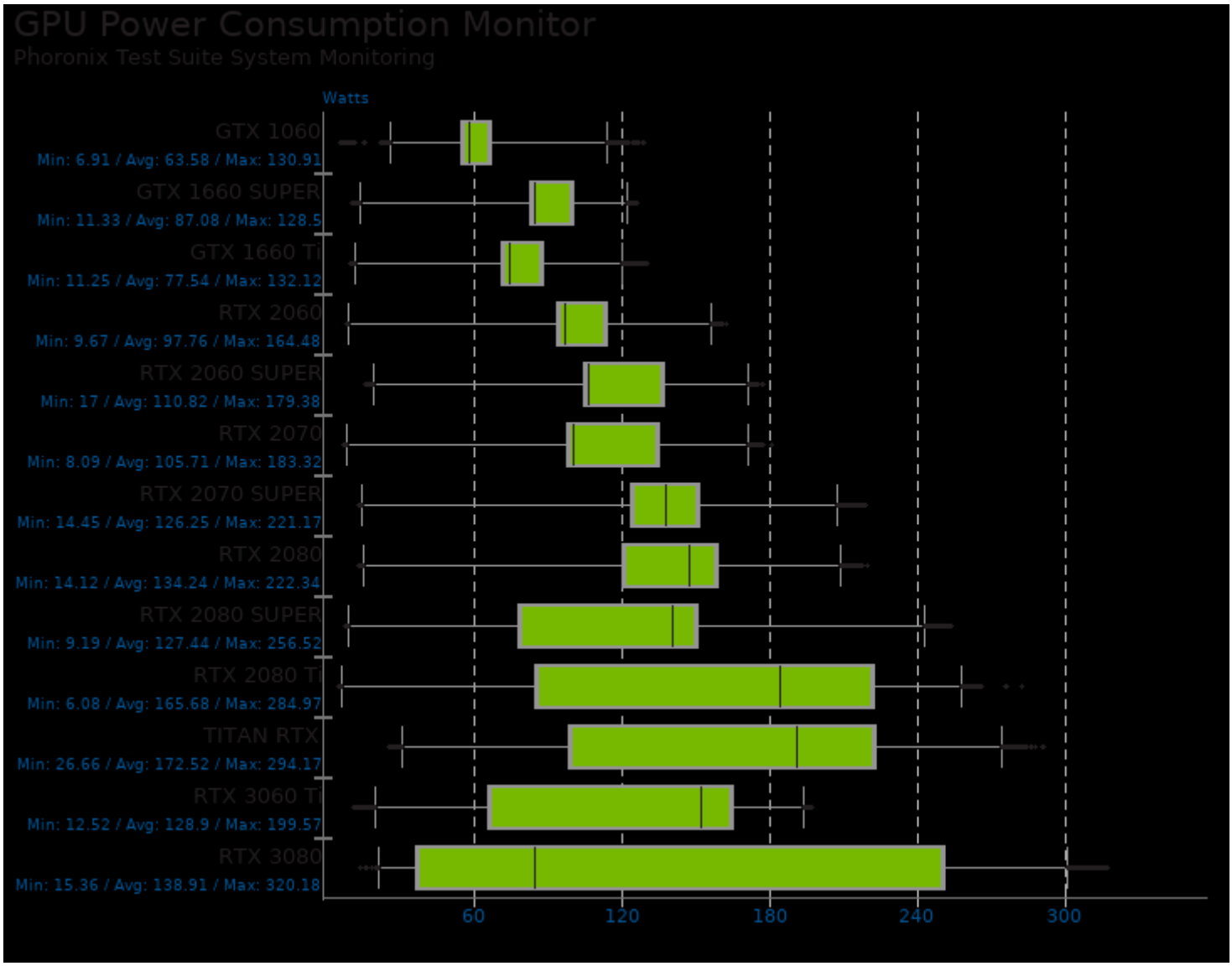
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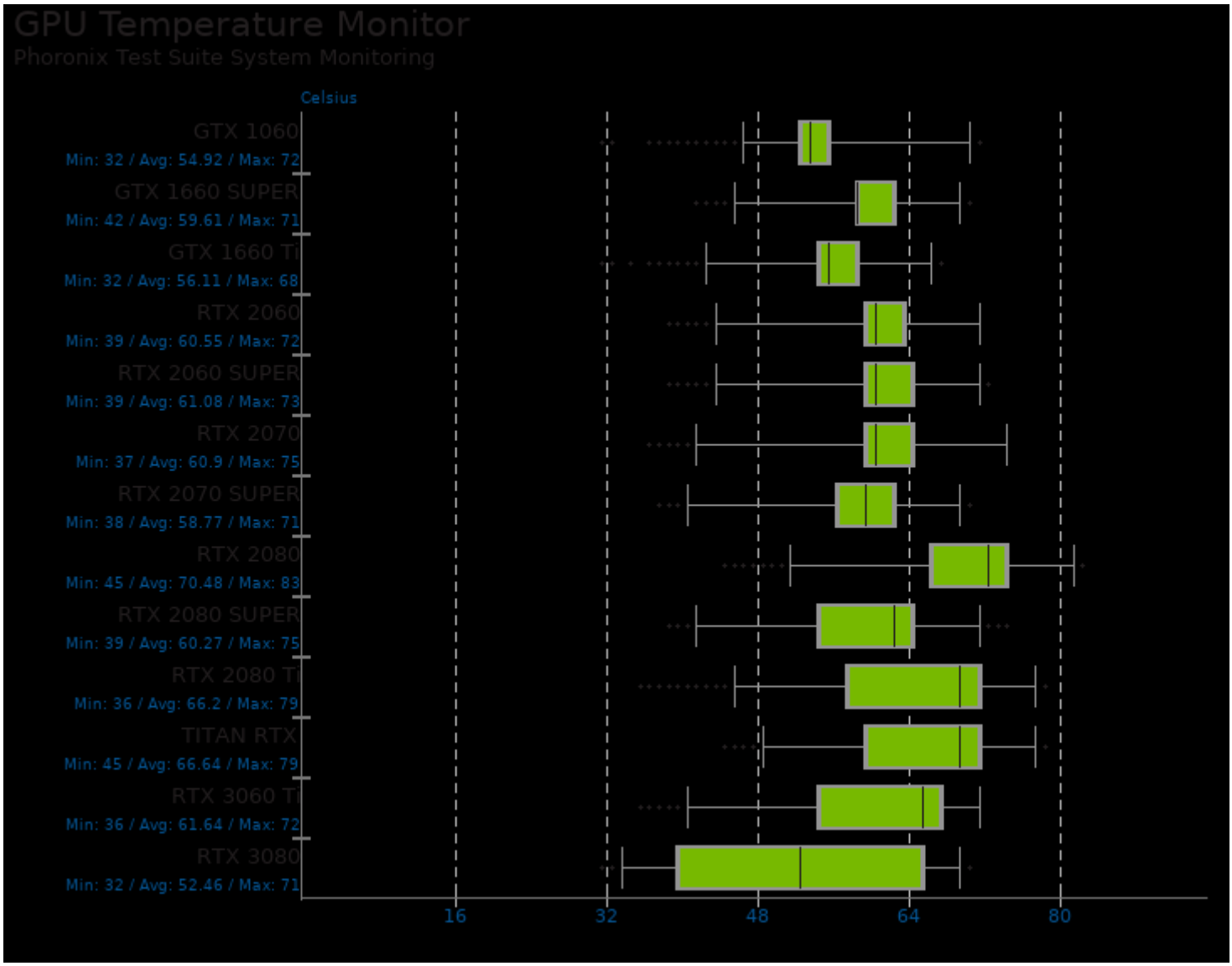
NVIDIA Compute Comparison



NVIDIA Compute Comparison

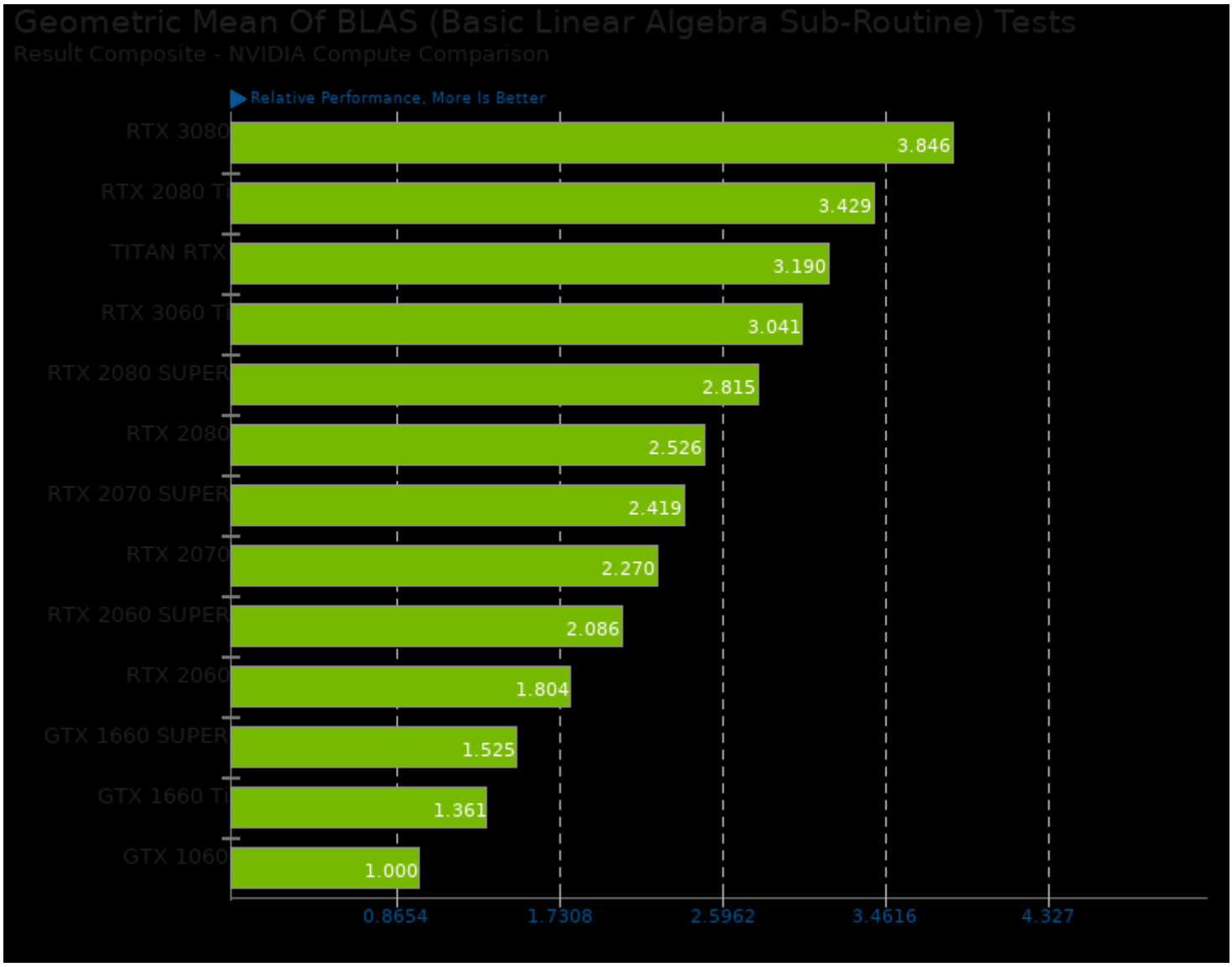


NVIDIA Compute Comparison



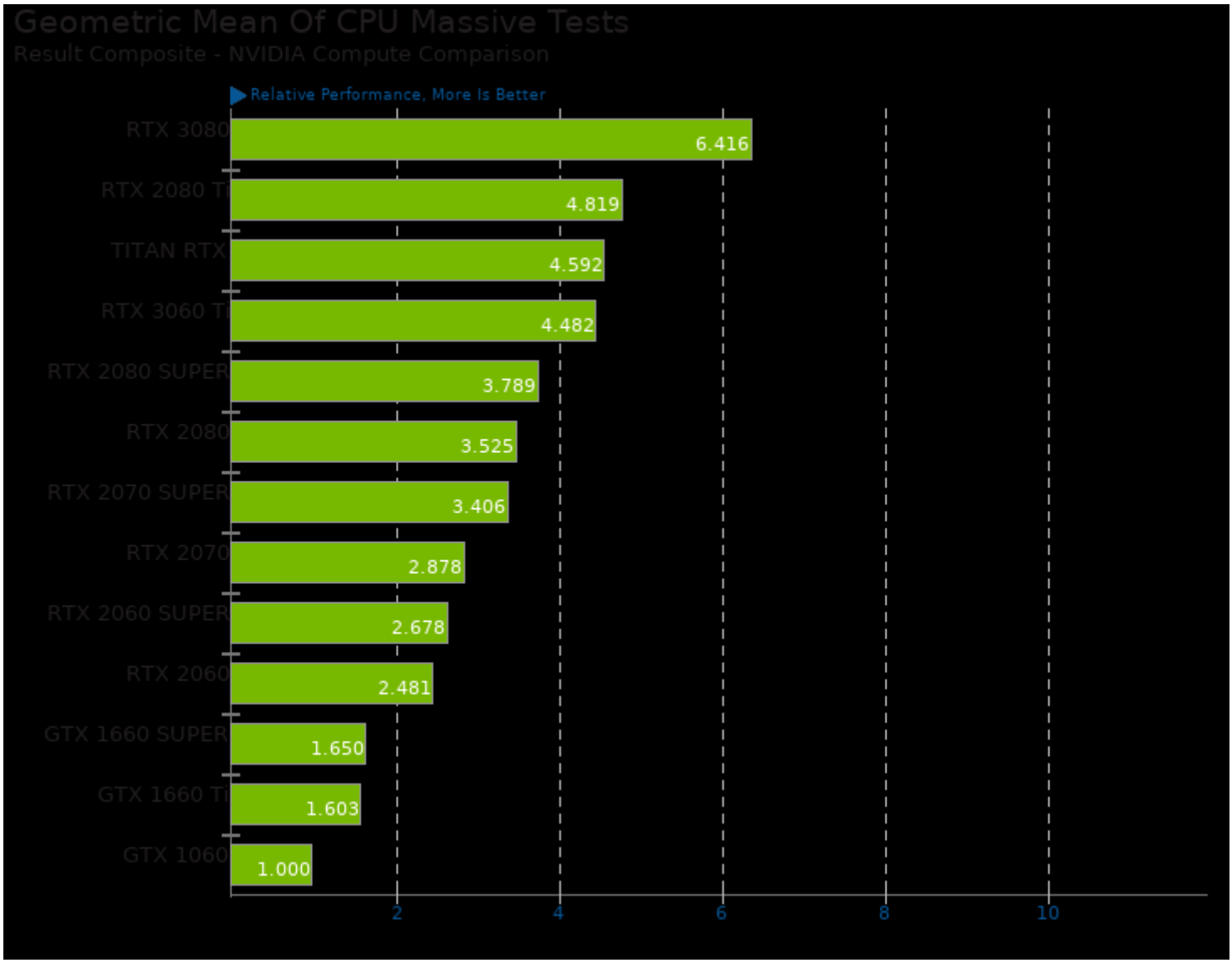
NVIDIA Compute Comparison

These geometric means are based upon test groupings / test suites for this result file.



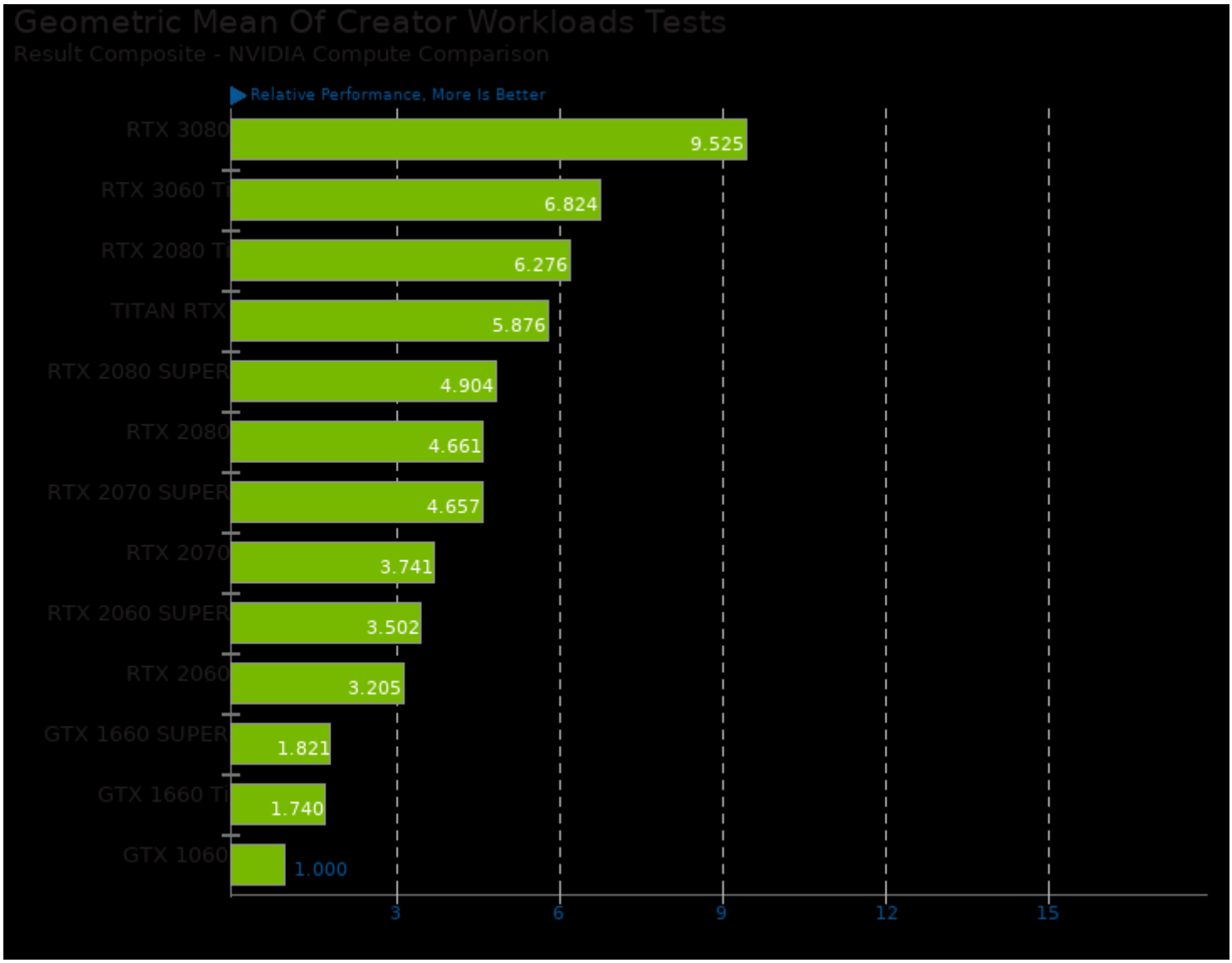
Geometric mean based upon tests: pts/arrayfire and pts/lczero

NVIDIA Compute Comparison

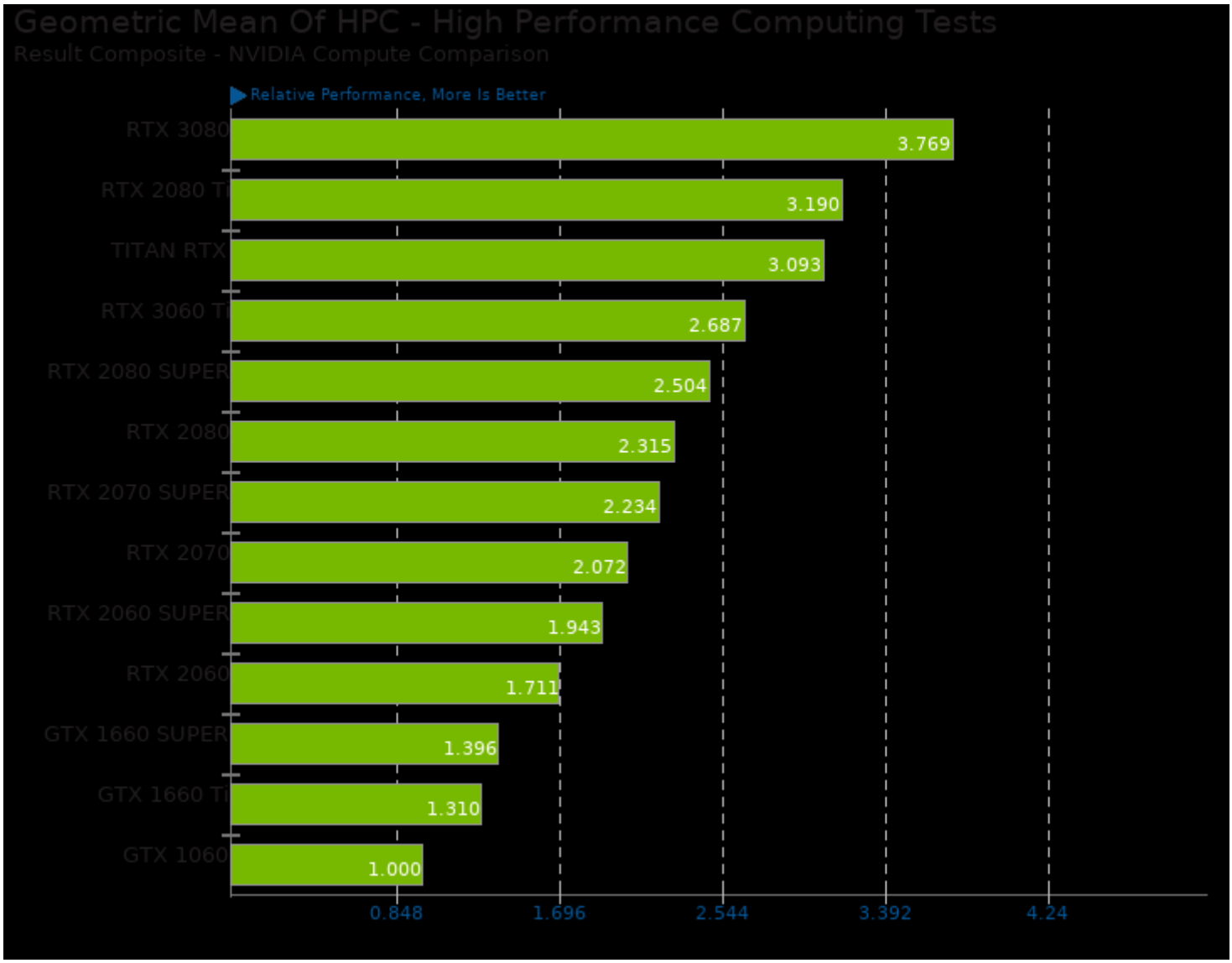


Geometric mean based upon tests: pts/geekbench, pts/lczero, pts/plaidml and pts/blender

NVIDIA Compute Comparison

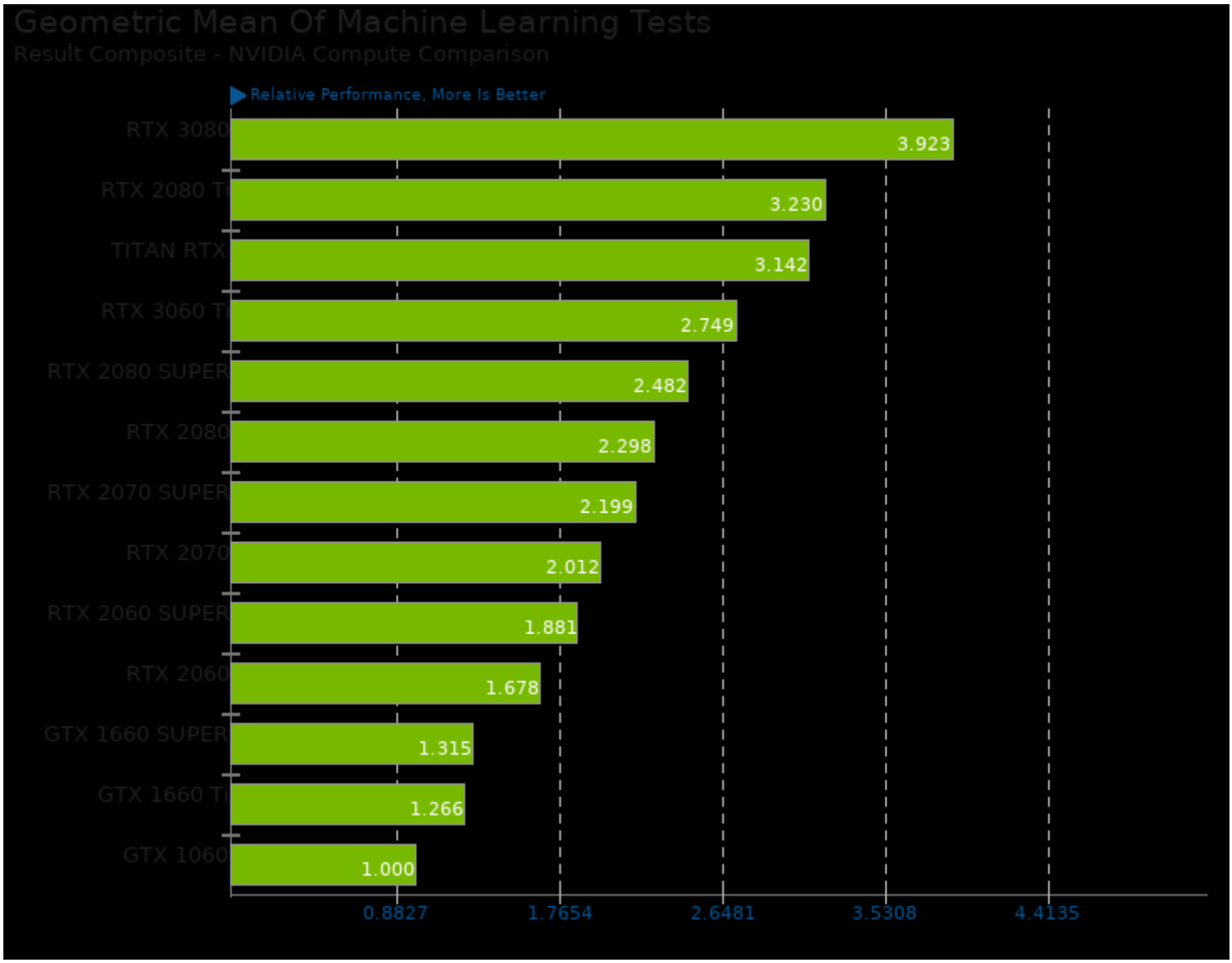


Geometric mean based upon tests: pts/blender and pts/indigobench



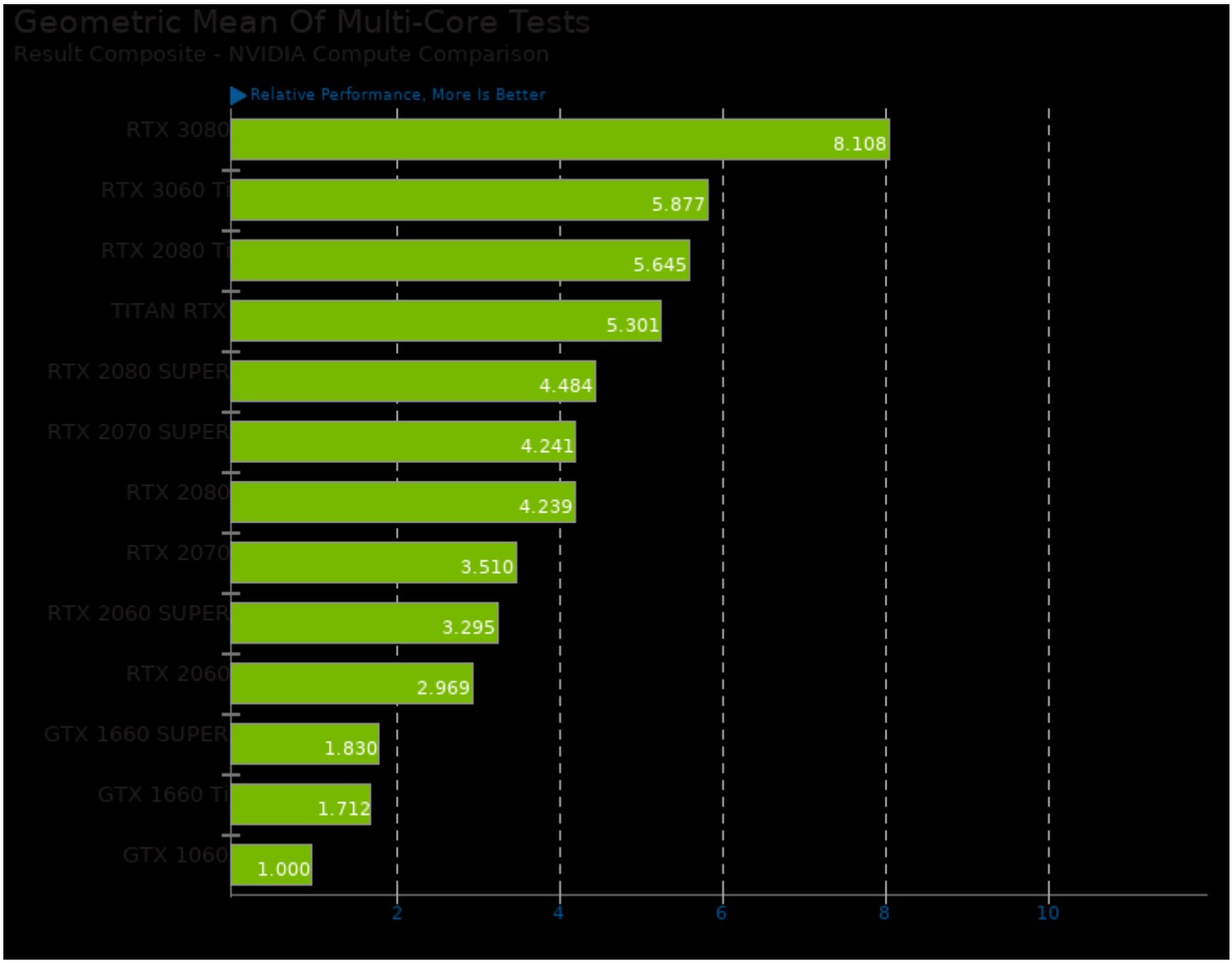
Geometric mean based upon tests: pts/arrayfire, pts/plaidml and pts/lczero

NVIDIA Compute Comparison



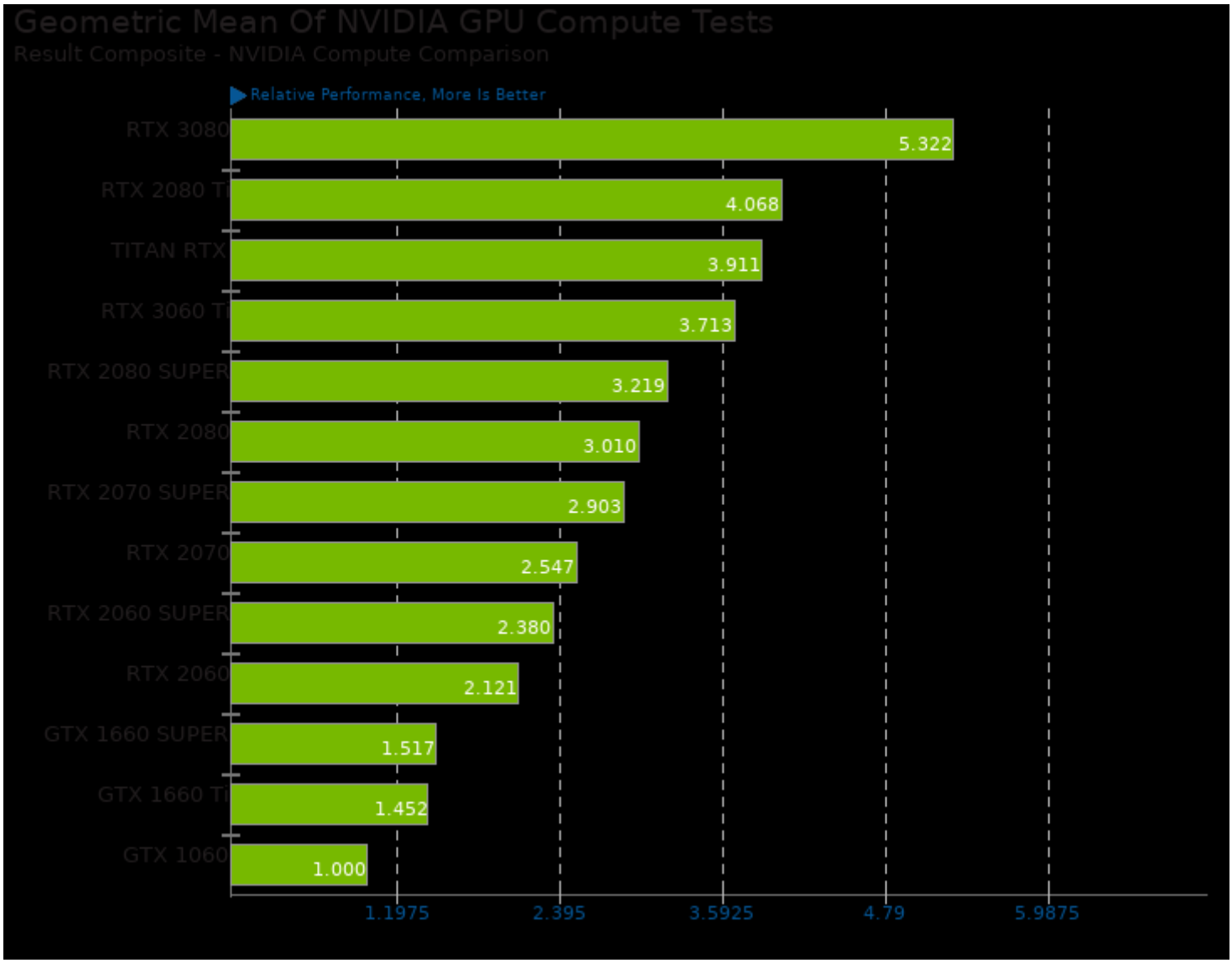
Geometric mean based upon tests: pts/plaidml and pts/lczero

NVIDIA Compute Comparison

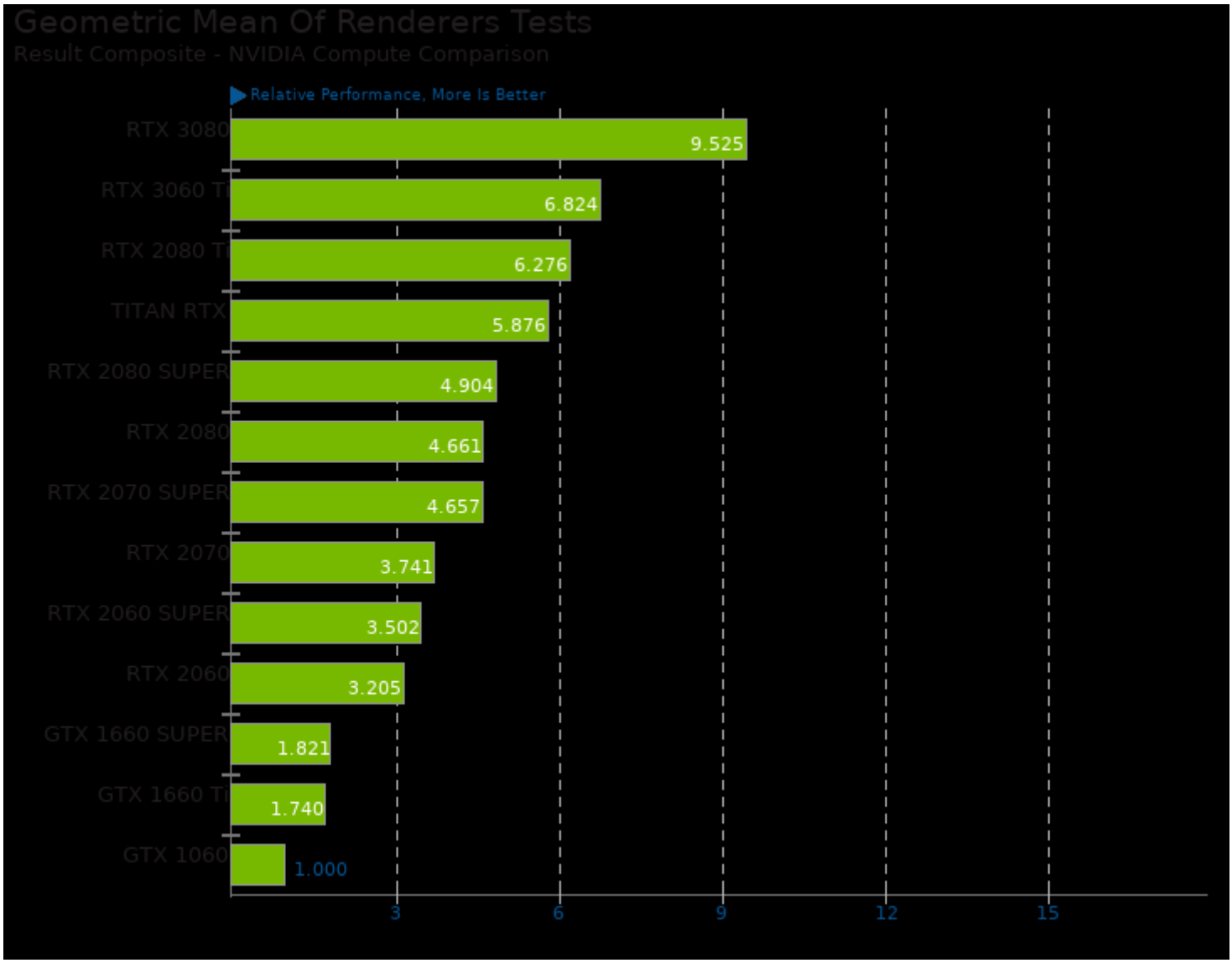


Geometric mean based upon tests: pts/blender, pts/arrayfire and pts/indigobench

NVIDIA Compute Comparison

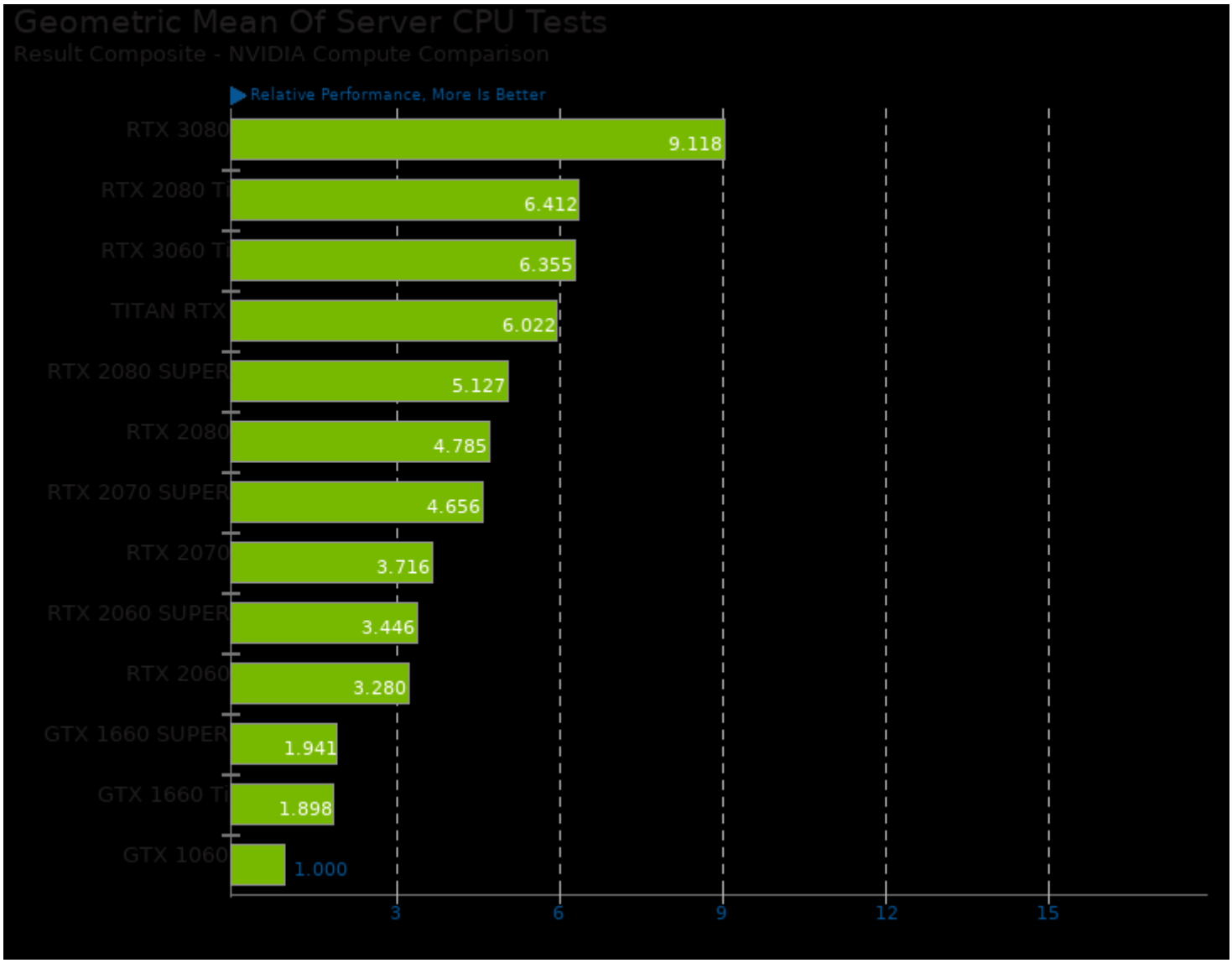


Geometric mean based upon tests: pts/fahbench, pts/octanebench, pts/arrayfire, pts/clpeak, pts/plaidml, pts/lczero, pts/redshift, pts/indigobench, pts/blender, pts/vkfft, pts/realsr-ncnn and pts/waifu2x-ncnn

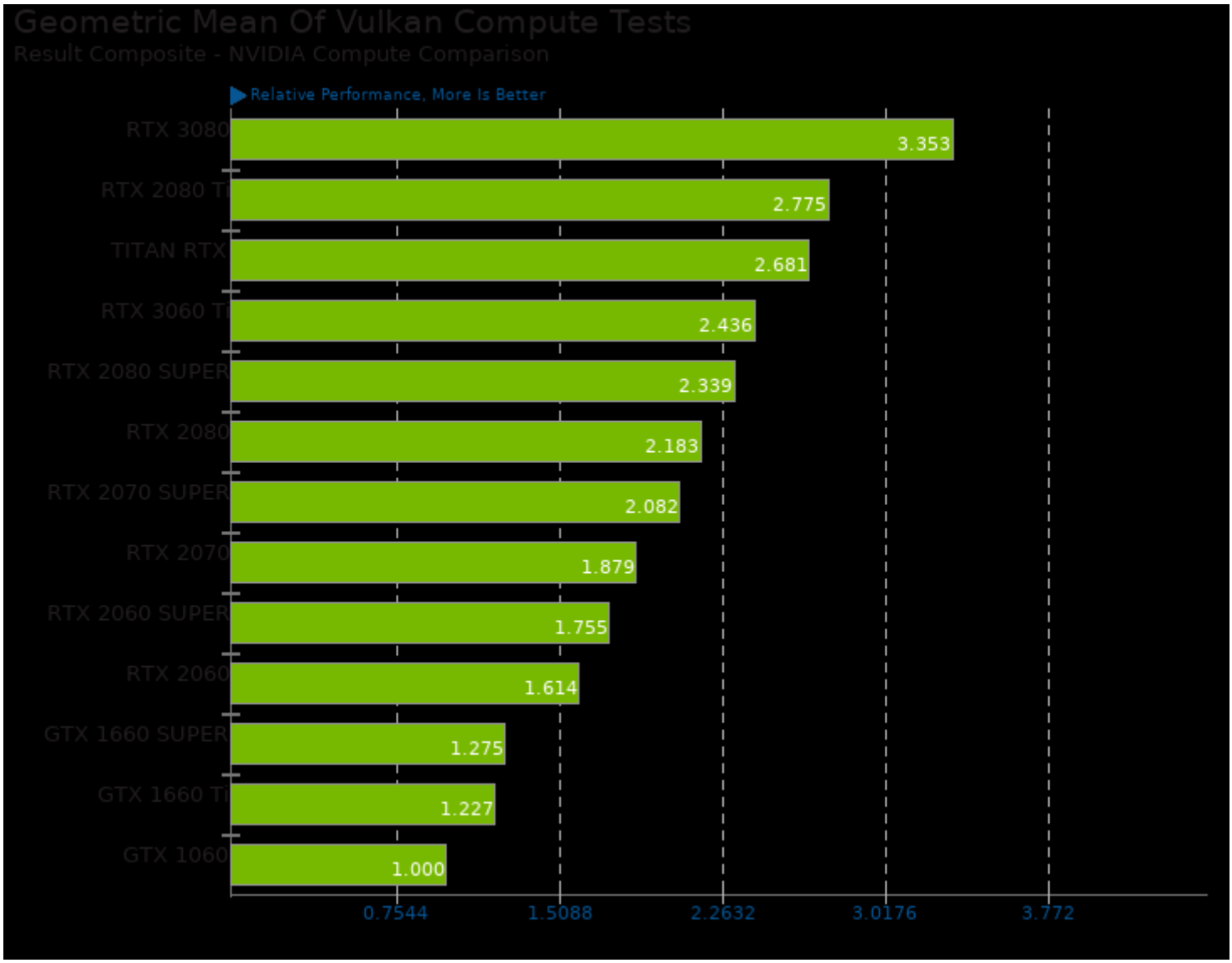


Geometric mean based upon tests: pts/blender and pts/indigobench

NVIDIA Compute Comparison



Geometric mean based upon tests: pts/blender and pts/geekbench



Geometric mean based upon tests: pts/vkfft, pts/realsr-ncnn and pts/waifu2x-ncnn

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